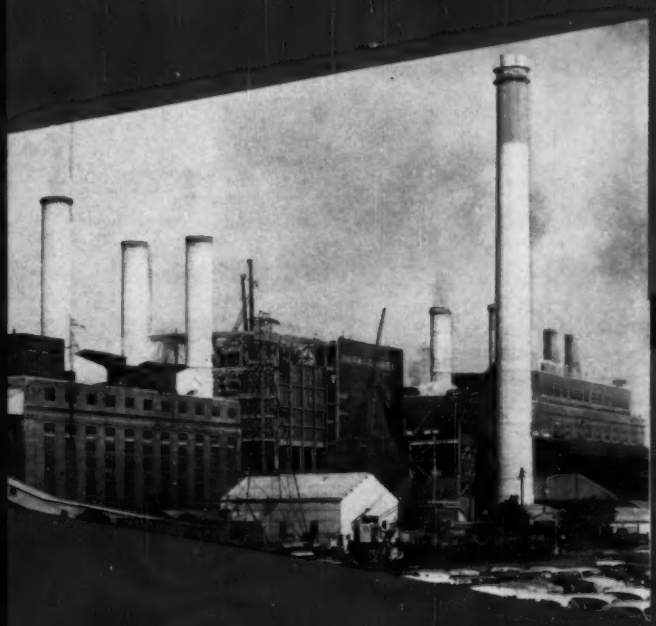
The Electrical Industry's Weekly Magazine

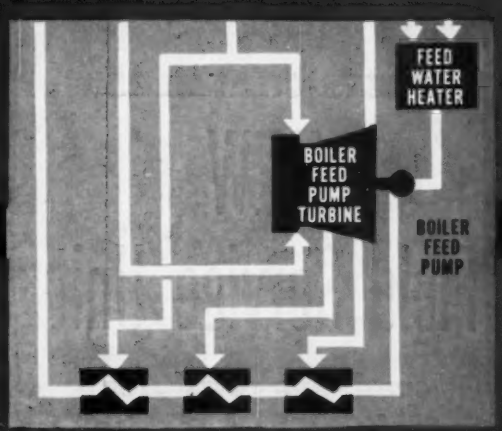
March 17, 1958

Electrical World

Price 50 Cents

A McGraw-Hill Publication





Drives for FEED PUMPS

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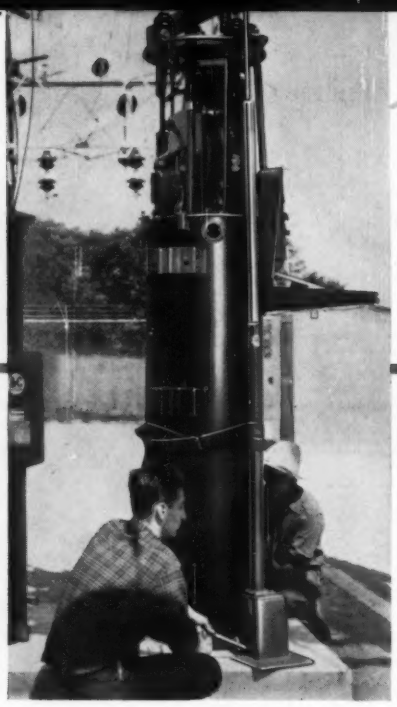
Motors, Shaft Drives Serve Other Large Units ... p 68

Transformer Troubles at Chief Joseph - p 63



Convenient, easy-to-use hydraulic untanking jacks are available to all Allis-Chalmers regulator users.

Mobile unit carries all needed tools and repair parts. Oil storage tank, filter press and dielectric oil tester are in trailer.

ALLIS-CHALMERS

NEW Field Service Unit

combines regulator training and service

Mobile service unit brings trained service personnel and instruction on preventive maintenance to regulator site.

THIS mobile unit has proved to a growing list of utilities the economy of preventive maintenance on a planned program.

Utilities are encouraged to have their own men participate for training.

The service includes detailed inspection of mechanism, checking band width, voltage level, and relay contacts, retouching paint, replacing parts and filtering oil if necessary . . . thus extending regulator life . . . eliminating potential troubles.

All service, whether for single or three-phase regulators, is done at the regulator site. Full advantage is taken of *unit construction* of Allis-Chalmers regulators. Downtime is reduced.

See New Movie

Additional information in colored 16-mm sound film can be obtained by contacting your nearest A-C office or writing Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS **ALLIS-CHALMERS**

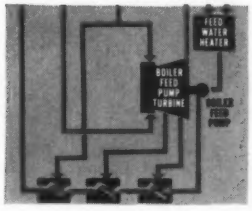
A-5584

Electrical World

Vol. 149, No. 11 MARCH 17, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue



GENERATION

Steam Turbine Returns to Drive BF Pumps

R. P. Moore, Niagara Mohawk Power Corp.

First used at Huntley Station 40 years ago, they now show benefits in driving pumps for new 200-Mw unit.....p 68

What Kind of Drive for Feed Pumps

L. M. Olmsted, Electrical World

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The Economy: Rebound Ahead!

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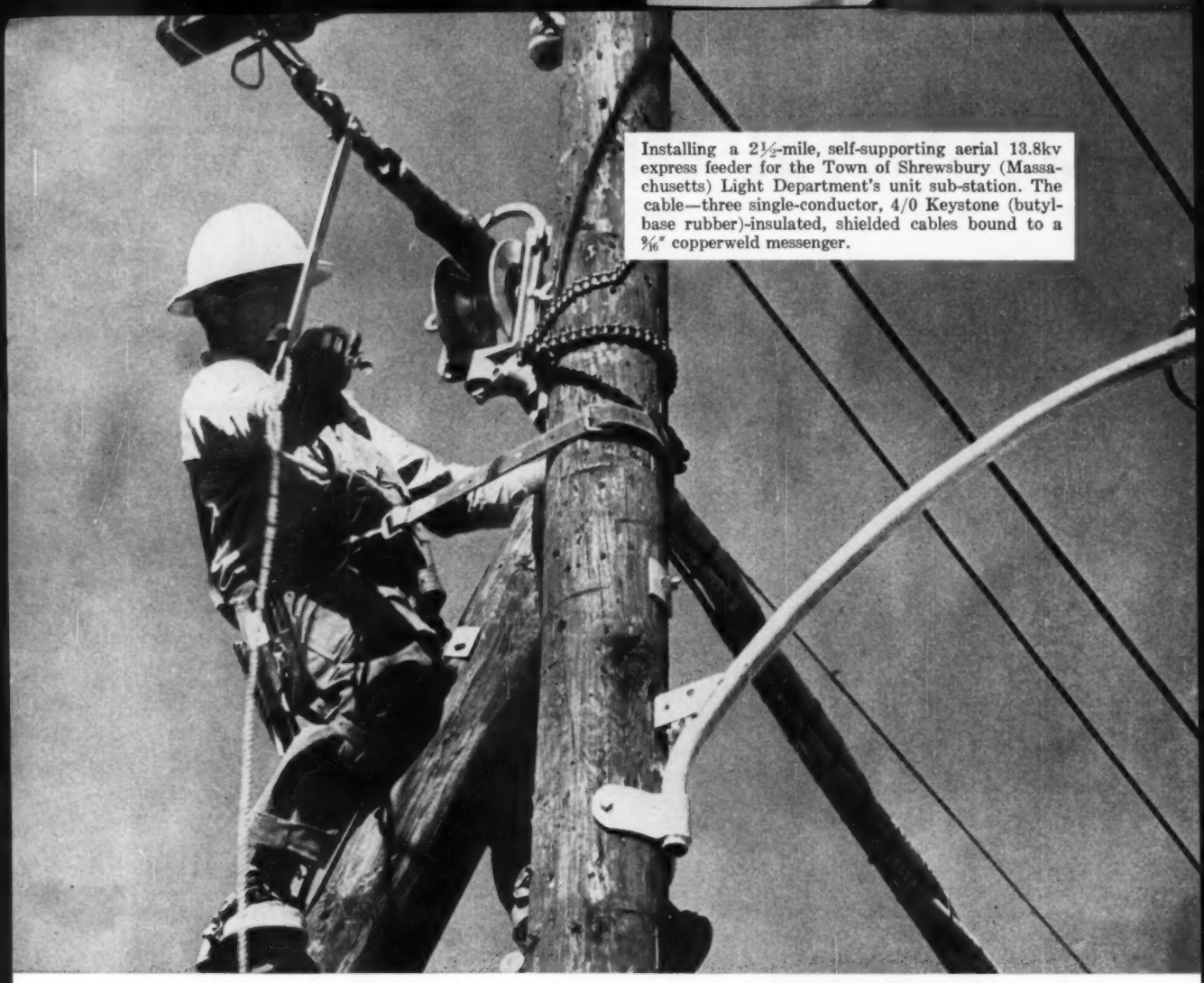

Installing a 2½-mile, self-supporting aerial 13.8kv express feeder for the Town of Shrewsbury (Massachusetts) Light Department's unit sub-station. The cable—three single-conductor, 4/0 Keystone (butyl-base rubber)-insulated, shielded cables bound to a 9/16" copperweld messenger.

Contractor: The Theodore D. Bross Line Construction Company

Modernize with Okonite self-supporting aerial cable...

The Town of Shrewsbury Light Department did just this when they recently installed a 13.8kv express feeder. They chose an Okonite self-supporting aerial cable because they wanted a superior installation that would practically eliminate tree trimming costs . . . be more reliable in storms (operate even with poles down) . . . reduce pole congestion . . . assure fewer interruptions or outages . . . have a moderate cost . . . provide improved voltage regulation because of lower reactance . . . and be more economical to operate and maintain than equivalent open wire lines.

In choosing Keystone (butyl-base rubber)-insulated cables for this important feeder, Shrewsbury Light Department was also banking on high voltage cable with a record for long and dependable service . . . high resistance to ozone and corona cutting . . . ability to take sharp bends . . . stable operation at copper conductor temperatures as high as 85C at 15kv . . . excellent resistance to moisture and extremes of temperatures.

For the complete story on Keystone-insulated cables, contact your Okonite representative . . . or write for Bulletin EW-463 where the results of field service and tests are reported with graphs and charts together with 36 pages of technical data.

The Okonite Company, Passaic, New Jersey.

where there's electrical power . . . there's **OKONITE CABLE**

4912

Utility Budget Estimates

The validity of the utility budgets which we report in Electrical World are constantly being questioned by those who sell to utilities. We are constantly making checks to analyze changes in the trends so as to keep everyone up-to-date.

In January we reported utility expenditures for 1957 only 1.8% under the estimates of a year earlier. This was typical of the accuracy of the utilities' own estimates from year to year.

The last report on the "Outlook for Public Utilities" by Lionel D. Edie & Co covers a different angle of the problem. Their research has been in the field of the changes in the estimates over a two-year advance period. In this case the study covers estimates for 1958 and 1959 which were made in 1957.

The Edie Co found that for the estimates made in early 1957, power companies overestimated 1957 by five or six percent. However, their current estimates for 1958 and 1959 run in excess of those a year ago by seven and five percent respectively.

These findings by the Edie Co may very well indicate that, as we have insisted all along, the power companies are sticking very closely to their long term plans. On this basis, the reduction in expenditures below budget in any one year will likely be made up in the succeeding years. Of course this trend may not show up in dollar figures when large discounts are as prevalent as today.

Fischer Black

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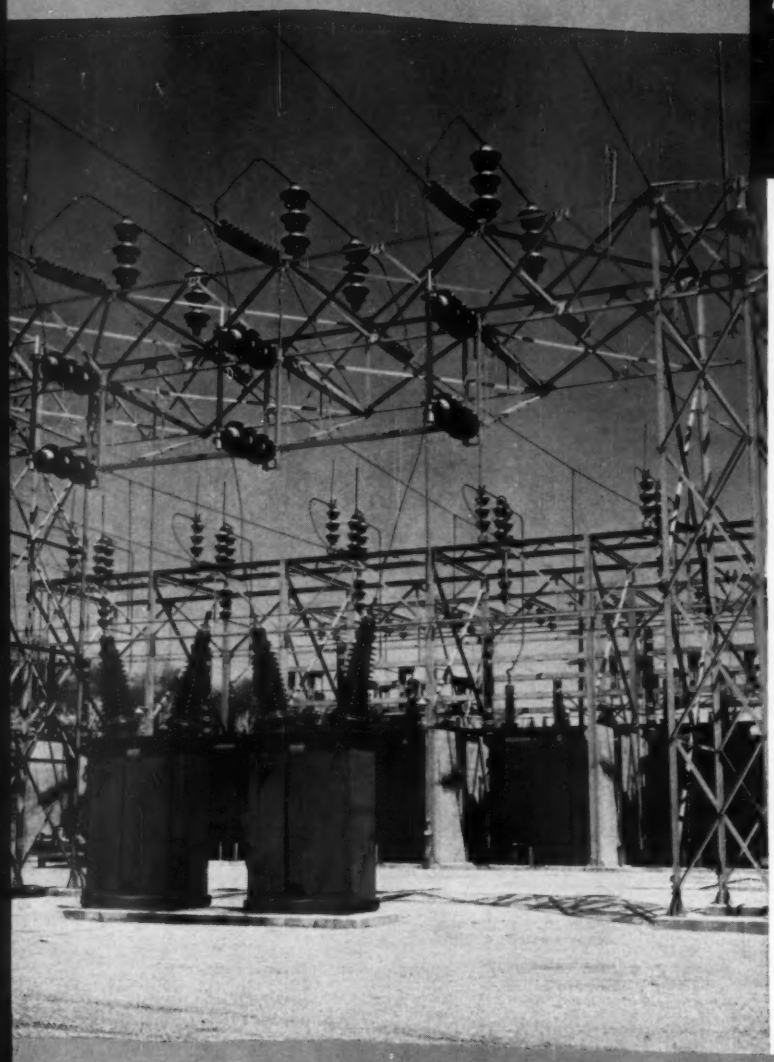
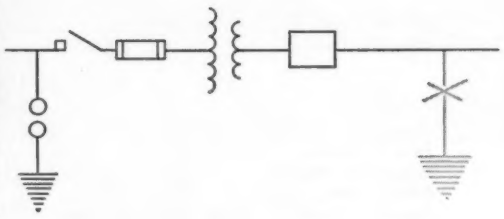


Can a primary power fuse "see" line-to-ground secondary faults?...



(Although the data illustrated are for self-cooled transformers, similar tables are available for forced-air-cooled transformers.)

POWER TRANSFORMERS

***TABLE 3 Minimum Ampere Ratings for the Primary Fusing of Three-Phase or Banks of Three Single-Phase Self-Cooled or Water-Cooled Power Transformers**

Nominal System Kv →	23		27.6		34.5		46		69		115		138	
Transformer 3-Phase Kva ↓	Full Load Current (Amps)	Fuse Unit Rating (Amps)	Full Load Current (Amps)	Fuse Unit Rating (Amps)	Full Load Current (Amps)	Fuse Unit Rating (Amps)	Full Load Current (Amps)	Fuse Unit Rating (Amps)	Full Load Current (Amps)	Fuse Unit Rating (Amps)	Full Load Current (Amps)	Fuse Unit Rating (Amps)	Full Load Current (Amps)	Fuse Unit Rating (Amps)
1000	25.1	40E	21	30E	16.7	25E								
1500	37.7	50E	31.4	50E	25.1	40E	18.9	25E	12.5	20E	7.6	10E	6.3	10E
2000	50.3	65E	41.8	65E	33.5	50E	25	40E	16.8	25E	10	13E	8.4	13E
2500	62.8	100E	52.5	80E	42	65E	31.5	50E	21	30E	12.5	20E	10.5	15E
3750	94.3	125E	78.5	125E	63	100E	47	65E	31.5	50E	19	25E	15.7	25E
5000	126	175E	105	150E	84	125E	63	100E	42	65E	25	40E	21	30E
7500	188	250E	157	250E	126	175E	94	125E	63	100E	37.5	50E	31.4	50E
10 000	252	400*	210	300E	167	250E	126	175E	84	125E	50	65E	42	65E
15 000	376	600*	314	500*	252	400*	189	250E	125	175E	76	100E	63	100E

*Use two fuse units in parallel, each having an ampere rating half of the listed ratings.

Here's an up-to-date answer:

The answer is a qualified "yes" and depends on selection of the proper fuse in the proper ampere rating and speed.

Let's examine fuse selection. Until now, for want of a better approach, the protection engineer has had to use fusing ratios or ampere rating recommendations which were arbitrarily high. Allowances had to be made for not only short-time daily overloads *(both with, and without, forced-air cooling)*, switching, and energizing transients but also for damaging of the fusible element. Moreover, extra provision had to be blindly made for short-time emergency overloading. In this way he was assured that the fuse would not blow unnecessarily. But unfortunately, the full protective range of the modern power fuse was lost.

To help the protection engineer avoid such overfusing, S&C has developed tables of Minimum Ampere Rating Recommendations* for its SMD Power Fuse (see one of four such tables below, left), each one of which is a "sharp-pencil" recommendation that provides real protection for the transformer against secondary faults, even line-to-ground.

The key to these recommendations lies in the precise significance of the term "minimum" in contrast with the customary "cover-all" use of the word. These recommendations have been pared down by tailoring them to include provisions only for transients and short-time daily overloads of the magnitudes set forth by ASA.

These minimum ampere rating recommendations expressly *exclude* allowances for short-time emergency overload, and margins for fuse damage. Here are the reasons:

1. The margin for fuse damage is obviously unnecessary with S&C silver fusible elements.
2. The short-time emergency overloading of fuses is a nonrecurring, controllable condition — such as would occur when one transformer in a duplex substation setup is temporarily out of service (thus placing all the load on the other transformer).

To enable the protection engineer to determine what degree of short-time emergency overload an SMD fuse can sustain, S&C has developed a family of "Short-Time Emergency Overload Capability Curves." These curves plot overload time in hours against overload current. The curves will show that in most applications the fuse ratings given in the Minimum Ampere Rating Recommendation tables will have adequate short-time emergency overload capability, even though allowances were not made for such overloads in the Recommendation tables. By using this special information—new to power fuses—the protection engineer can avoid revising his ampere rating selection upwards to take care of a short-time emergency overload condition that might occur only once a year. Therefore, he does not have to give up some transformer protection.

This paring down of ampere rating recommendations is done to enable the fuse to "see" faults of a much lower order than would otherwise have been possible. A fuse naturally won't pick off the lowest line-to-ground faults, but transformer protection will be greatly increased.

Write for Data Bulletin 262, "Selecting SMD Fuse Units," to S&C ELECTRIC COMPANY, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

The ampere ratings listed in the table (left) will carry continuous loads within the nameplate rating of the transformer, or short-time daily overloads as set forth below.

Daily Overloads to Give Normal Life Expectancy

(Abstract from ASA Publication, "Guide for Loading Oil-Immersed Distribution Transformers and Power Transformers," Appendix C57.92, published January, 1956.)

Time (Hours) ↓	Times Rated Kilovolt Amperes		
	Self-Cooled and Water-Cooled Transformers		
Initial Load* (Percent) →	90	70	50
½	1.59	1.77	1.89
1	1.40	1.54	1.60
2	1.24	1.33	1.37
4	1.12	1.17	1.19
8	1.06	1.08	1.08

*Use either average load for two hours previous to load above rating or average load for 24 hours (less overload period), whichever is greater. Ambient temperature assumed is 30° C for air and 25° C for water.

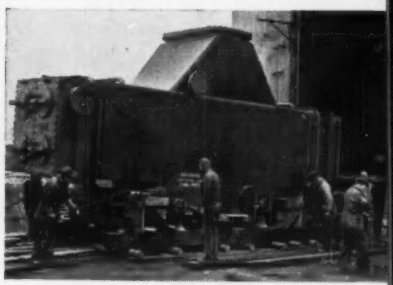
S&C ELECTRIC COMPANY

Another Example of Allis-Chalmers

Other Allis-Chalmers Firsts

First condenser with welded tubes to insure against condensate contamination. Welded construction forms a seal with tube sheets to meet new problems created by supercritical pressure, nuclear power, and once-through boiler installations.

First condenser for first commercial-type nuclear power plant in operation is Allis-Chalmers 5300-sq-ft unit with aluminum tubes, double tube sheets, special leak tightness.



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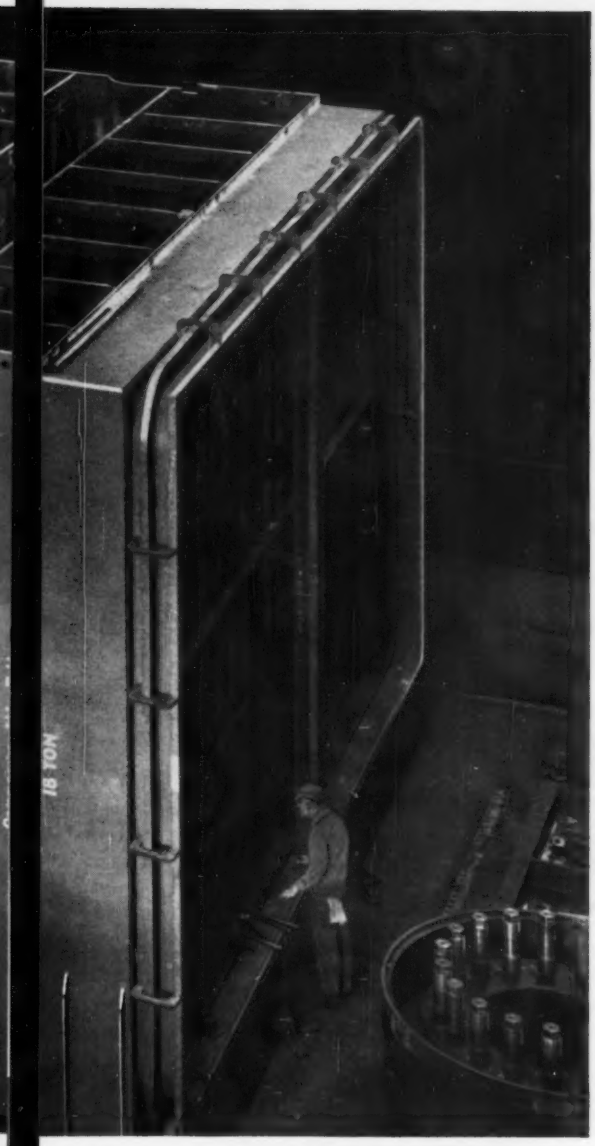
Condenser Leadership



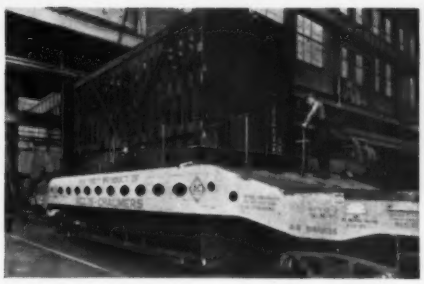
World's Largest Condenser

200,000-square-foot single-shell condenser for Commonwealth Edison

Engineering ability to handle the extraordinary jobs, such as this giant unit, accounts for Allis-Chalmers continued leadership in condenser development. The unit will serve another A-C achievement—a 327 mw steam turbine generator at the utility's Fisk Station.

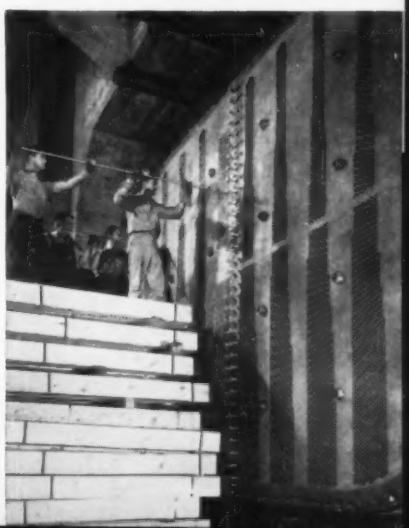
Installation of so large a condenser is not a simple task. However, a unique method devised by A-C is used to minimize erection problems. Complete factory assembly aligns the sections perfectly. Dowel and pull-up blocks are installed at each joint to insure exact alignment when condenser is reassembled in the field. Specially built freight cars permit shipment of the entire shell in only four sections.

For more information on the most advanced developments in condenser engineering, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



First with specially built freight cars to accommodate large condenser sections, thereby reducing shipping problems, cutting installation time and costs.

First full-size condenser in public utility to incorporate aluminum tubes. This installation is part of a long-range study that may lead to industry-wide savings.



ALLIS-CHALMERS

where there's a road there's Southwire Service

SERVICE on a par with the quality of its products has always been a basic policy of Southwire.

To assure customers of on-time delivery, Southwire operates its own modern fleet of trucks. They travel nearly 3 million miles a year—from coast to coast and border to border.

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- Cable Accessories

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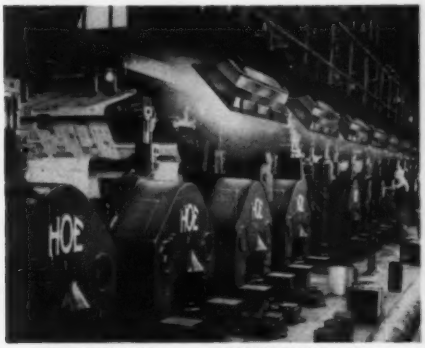
"BI-FLO UPLIFTER" 72% downlight — 28% uplight, provides greater seeing comfort for industrial areas such as **Assembly Lines.**

"D" LINE High efficiency, all-purpose fixtures with upward component of light to relieve severe brightness contrast. Ideal for **Machine Shop** and **Factories.**

DURATACH LINE Rugged fixture that offers easy, low cost maintenance plus complete interchangeability. Widely used in **Industrial** and **Textile** plants.



"DUST-TIGHT" and **"VAPOR-TIGHT"** Specialized fixtures for hazardous and non-hazardous locations such as **Printing Plants, Flour Grain Mills, etc.**

and now Power-Lume

latest addition to *Wheeler*

"PACKAGE PLAN" lighting

Power-Lume by Wheeler — a new fixture in 2 types of Construction "F" and "V" . . . specifically designed to utilize fully the extra illuminating power of the new Power-Groove lamps. Delivers TWICE the amount of lumen output per foot of lamp length! For complete details, write for New Product Data Sheet No. 100 D.

Wheeler

REFLECTOR COMPANY

(Division of Franklin Research Corp.)

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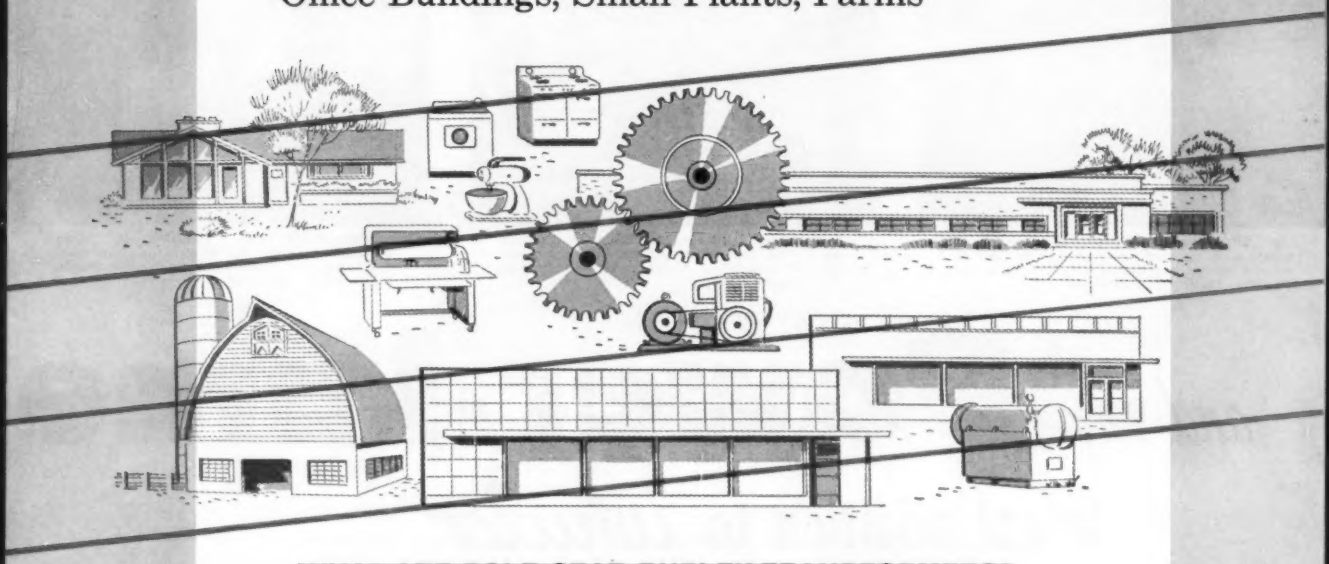
The Most Economical Way to Supply Power for Single-Phase Lighting and Three-Phase Motor Loads in Homes, Shopping Centers, Office Buildings, Small Plants, Farms



WHAT ARE POLE STAR DUPLEX TRANSFORMERS?

Pole Star Duplexes were developed specifically to provide single- and three-phase power simultaneously from single-transformer pole installations. They are composed of two standard core-and-coil assemblies mounted in a single tank—the most common combination being 37½-kva and 15-kva units to provide a total capacity of 52½ kva. Relative proportions of single-phase and three-phase power can be varied according to load conditions.

Ratings range from 20 kva (15- and 5-kva units) to 100 kva (75- and 25-kva units). The high voltage (available from 2400 to 13200 volts, without taps) may be either open delta or open wye, with a low voltage of 240 volts open delta. A 120-volt mid-tap is brought out for single-phase lighting service. All Pole Star Duplexes are available with or without CSP protective equipment.

McGRAW EDISON

PENNSYLVANIA POLE STAR TRANSFORMERS

PENNSYLVANIA

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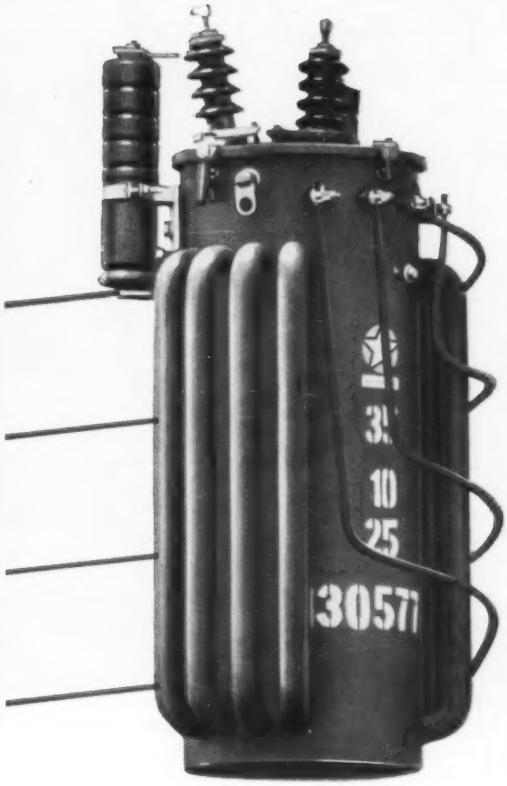
by installing

LIVE BETTER ELECTRICALLY

Pole Star

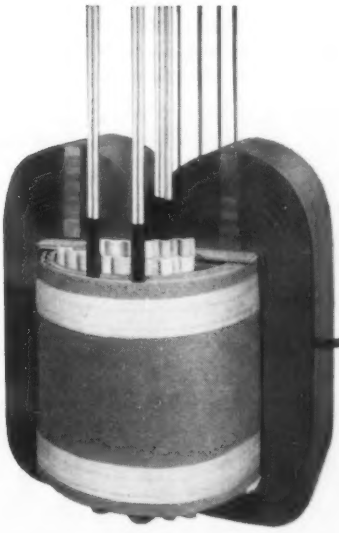
duplex transformers



Greater use of air conditioners, do-it-yourself power tools and other electrical equipment is rapidly increasing the need for multiphase service to homes and commercial establishments. Now, new Pole Star Duplex Transformers make the addition of such service easier—and more economical—by providing simultaneous single- and three-phase power from single pole-mounted transformers.

By eliminating the need for banks of two or three units, Pole Star Duplexes simplify installation . . . lower initial costs as well as long-range maintenance costs. Mounted directly to the pole, the new duplexes require no extra crossarms . . . make a neater appearance than do banks of transformers.

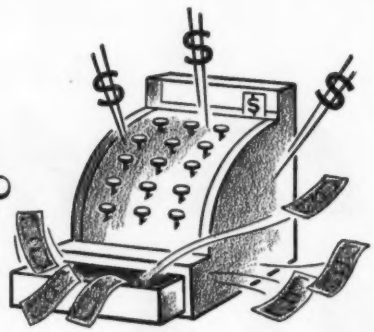
When helping your customers to live better electrically, it will pay you to install Pole Star Duplexes wherever multiphase service is required from pole-mounted units. For more details, write to Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.



Like all other Pole Stars, the new duplex transformers feature Pennsylvania's patented lap-on-top core, with "built-in" low exciting current and low core loss. All design and construction features are comparable to standard Pole Stars . . . noted for sustained performance in every type of distribution transformer installation.

DISTRIBUTION TRANSFORMERS

Are Your Contacts Costing You Too Much?



A close examination of the contacts you now use in the manufacture of your equipment may turn up unexpected ways to cut costs. Mallory contact specialists are fully qualified to do just that for you—to make a critical analysis of your contact problem and advise you of the best design to solve that problem.

When you put this long experience in contact alloys and contact design engineering to work, you can get maximum mileage from your contact dollars. You'll be calling on the kind of experience that has already served and saved for many manufacturers.

When the Mallory engineer looks over your specifications, tolerances may be broadened, machining operations simplified, and performance specifications met or improved. He'll investigate service requirements; a more economical alloy for contact or backing may serve the needs. He'll consult with you on design; for best combination of cost and performance of contacts, backing member and assembly.

Mallory is equipped to fabricate complete subassemblies for you in their modern, well equipped plant—often at lower total cost than when you purchase components from separate sources.

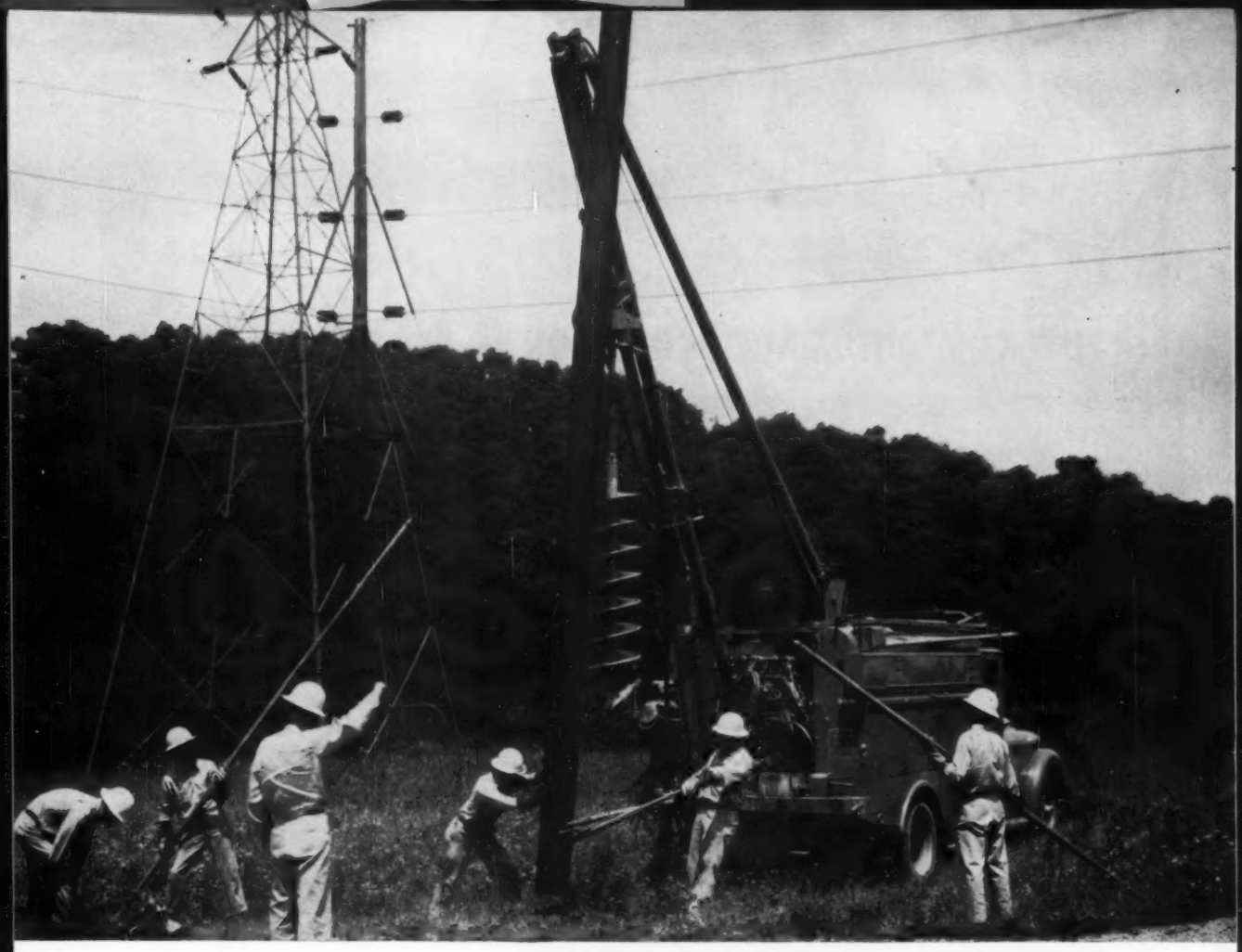
This consultation with a Mallory contact specialist could be the key to important savings for you. Write, or call—today.

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

Expect more...get more from

P.R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA



An action picture of the utility that didn't try to save a few dollars

Maybe the utility that bought this Holan body and power equipment could have saved a few dollars. But, instead of *saving*, they *invested*—and they receive their dividends in speed and long usage. See how their investment works for them!

EVERYTHING IS HYDRAULIC

Push a hydraulic control lever and the jacks come down to stabilize the truck. Push another lever and the derrick swings over. Push a third lever and the digger burrows into the ground without a shimmy, pulls out easily and shakes off the dirt. Then without a hint of strain, the 3-legged derrick sets the huge pole.

NO SKIMPING, NO CHEATING

Everything Holan makes it makes the right way. There's no skimping. No cheating to save a buck. The steel is high-tensile. The engineering is sound. The work is expert. That's why Holan equipment *sometimes* costs more, but *always* does the job best. When you specify, are you trying to save or are you investing?

EQUIPMENT IN THE PHOTO:

Series 4095 Hydraulic Jacks, self-stowing, move to full extension in 8 seconds, return to stowed position in 6 seconds. 14,000-pound extension.

Series 4401-H Hydraulic Earth Borer digs holes 8″ to 20″ wide, 8 feet deep.

Body is CMC-164. All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

Series 3700 Power Derrick, live-boom, three-legged. Lifts 12,000 pounds (tested at 22,000 pounds). Body-loads 5,000 pounds. Power feed uses weight and power of derrick to force digger into ground.

J.H. HOLAN CORPORATION

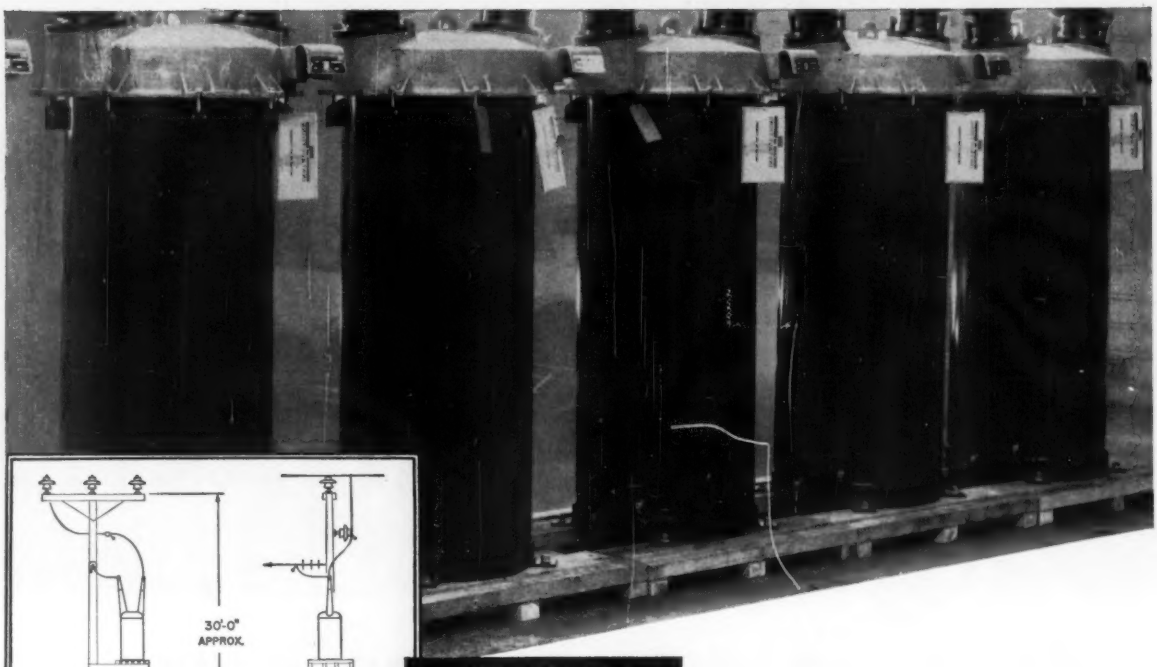
4100 WEST 150TH STREET
CLEVELAND 11, OHIO

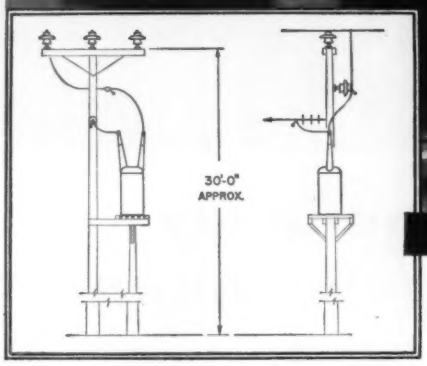
OTHER PLANTS: HOLAN CORPORATION OF GEORGIA, Griffin, Ga.
J. H. HOLAN CORPORATION, PHOENIX DIV., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

NEW *for* 34.5-46 Kv DISTRIBUTION

or LOW-COST AUTOMATIC PROTECTION for SUB-TRANSMISSION



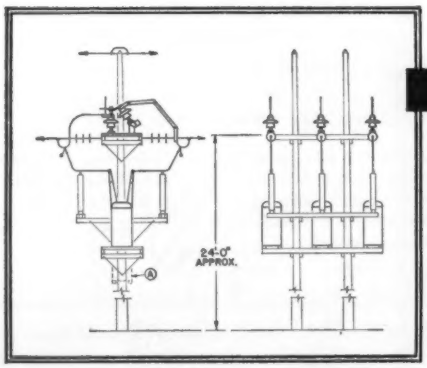


STUB POLE MOUNTING

For single phase lines, or span-spaced along three phase lines.

2 cycle

Simple type HVR installations plus low first cost—as compared with circuit breakers—offer, for the first time, economical automatic recloser protection for 34.5 and 46 Kv circuits.

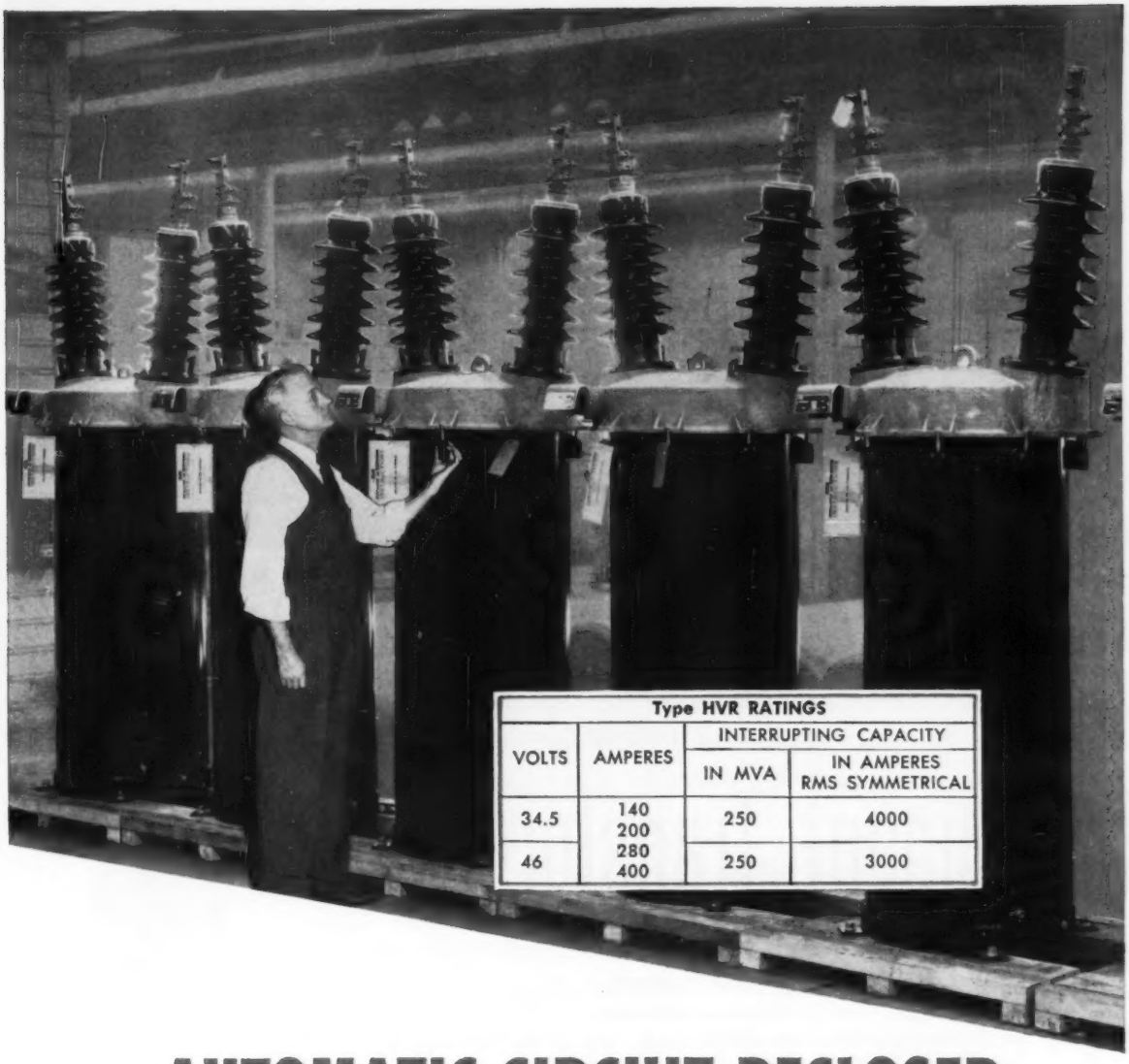


POLE LINE RIGHT OF WAY

Compact H-frame mounting for 3-pole installation, with bypass and disconnect switches, and lighting arresters.

(A) Recloser in this position has been rotated 90 degrees, for convenience and easy removal or installation.

**Consult your I-T-E representative*



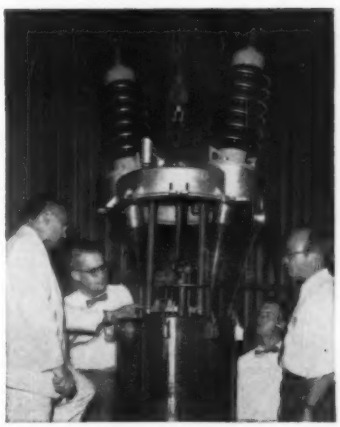
Type HVR RATINGS			
VOLTS	AMPERES	INTERRUPTING CAPACITY	
		IN MVA	IN AMPERES RMS SYMMETRICAL
34.5	140 200	250	4000
46	280 400	250	3000

. . . AUTOMATIC CIRCUIT RECLOSER

provides economical automatic protection

- Clears damaging faults in 2 cycles
- Restores service in 25 cycles

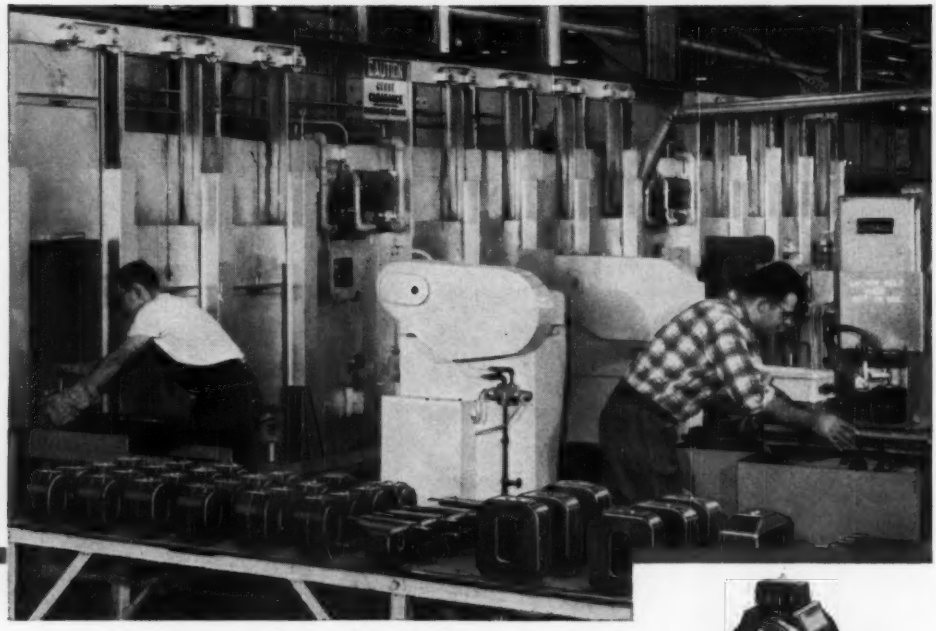
"Experience has shown that 70% to 95% of all high-voltage transmission-, subtransmission-, and distribution-line faults are non-persisting *if the faulty current is quickly disconnected from the system*" . . .



for more information—Test data available on request. . . . . . .

R&IE

R & I E EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.



Close temperature control of new ovens assures perfect curing of casing.

Allis-Chalmers expands production capacity to meet fast-growing demand for

Instrument Transformers

Epoxy Resin Cast

Industry's quick recognition of the superior quality of Allis-Chalmers instrument transformers cast of epoxy resin created a demand that was outstripping supply. Now, new facilities at Allis-Chalmers double the previous production capacity.

No Maintenance — Easily Installed

Epoxy resin, virtually a miracle material, gives transformers complete protection — both electrical and mechanical — either outdoors or indoors.

Allis-Chalmers epoxy resin transformers:

1. Have excellent dielectric properties.
2. Can withstand wide temperature variations and severe mechanical shocks.
3. Are maintenance free . . . require no painting, resist solvents.
4. Can be installed in any position . . . quickly, easily.

A number of new type instrument transformers for various applications have been added to the line. Additional types are now under development. Your nearby Allis-Chalmers office will give you details, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

A5685

Type TWM — 600-volt, indoor-outdoor light duty metering transformer for 200 through 800-ampere use. Window— 1⅜" x 2¾"

Type LM — 600-volt, indoor switchboard tripping and indicating transformer for 200 through 800-ampere use. Cable mounted — window 2¼" dia.

Type BKM — 600-volt, indoor-outdoor heavy duty metering transformer for 2000 through 4000-ampere use. Window — 4¼" square.

Type BKAW — 15,000-volt, outdoor heavy duty metering transformer for 1200 through 5000-ampere use. Window — up to 8¾" dia.

The Electrical Newsletter

FUTURE NEWS ▶ **Look for AEC to announce a stepped-up A-power development plan** next month. Program will probably include: (1) Federal construction of three experimental types of reactors (gas-cooled, dual purpose, and one to use natural uranium); (2) Increased federal research to develop more efficient fuel elements; and (3) Plan to help U.S. reactor makers and equipment firms sell reactors abroad.

LATE NEWS ▶ **NRECA steps up attack on Administration proposal** to bring private financing into the co-op programs. General Manager Clyde Ellis has (1) challenged Agriculture Secy E. T. Benson to a public debate on the effort to "kill rural electrification"; (2) urged Congress to vote big hike in REA loan funds over Administration's figure.

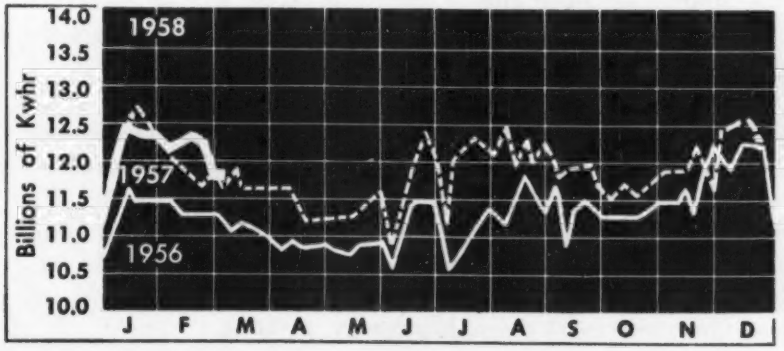
ACF Industries gets nod to design, construct, and test operate a boiling water reactor and conventional fuel-fired superheater in a 22,000-kw plant for Rural Cooperative Power Assn of Elk River, Minn. Expected operation date: Early 1960.

American Gas & Electric announces a record-breaking 1957. Not only did AG&E sell more electric power than any private utility in history (21.4-billion kwhr), but also set new highs in operating revenues, net and share earnings, generating capacity, peak load, construction, and average annual home use.

Management changes . . . Harold E. Ayer is new president of Lynn Gas & Electric . . . New Bedford Gas & Edison Light ups Peter C. Dirksen to VP-general manager . . . At Sierra Pacific Power, B. E. Lowes was elevated to VP and assistant to the president.

Obituary . . . T. Justin Moore, chairman of executive committee and general counsel of VEPCO, died last week . . . L. M. Smith, vice chairman of Alabama Power's board, died after a long illness.

Power Output—Down 0.6% (Week ending Mar. 8), Kwhr 11,793,000,000



Per Cent Change From Previous Year

	Feb. 22	Mar. 1	Mar. 8
Total U.S.	+3.5	+0.1	−0.6
New Eng.	+5.5	+2.2	+0.8
Mid. Atlan.	+2.5	+0.1	−0.9
Cent. Ind.	+0.3	−3.1	−3.0
West Cent.	+6.0	+0.8	+2.0
Southeast	+8.2	+0.5	−2.2
South Cent.	+4.2	+2.0	+1.6
Rocky Mount.	−1.1	+6.0	+3.1
Pacific			
NW	+1.3	+2.3	+4.2
SW	+3.0	+2.0	+2.6

Seasonally Adjusted Index 227.6

Week Ago 229.0 Year Ago 228.4

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 0.2%.

EVENTS ▶ **Utility construction is still on the rise.** The increase of 4% slated for 1958, although less than last year's, is being eyed by government officials as a key to the state of the nation's business (p 60) . . . You can get an idea of the scope of this rise in utility building by turning to the construction roundup starting on p 103.

The Chief Joseph Dam transformer situation, subject of numerous conflicting stories, is told by the Corps of Engineers on p 63.

WASHINGTON ▶ **The federal government would no longer help reimburse utilities** forced to relocate their facilities on public rights-of-way, if an Administration proposal soon to be unveiled succeeds (p 61).

ATOMIC PROGRESS ▶ **Some parts of the U.S. should have competitive A-power in ten years.** EEI's Technical Appraisal Task Force on Nuclear Power, which made this conclusion, also recommends specific approaches to accomplish this end (p 62).

GENERATION ▶ **Is use of steam-turbine drives for BF pumps a new trend** for large generating units? Some engineers think so, and back up their predictions by citing these advantages: improved plant thermal efficiency, lower plant investment, and elimination of some starting problems. While motors still hold the lead for units of 200 Mw and larger, steam turbine drives are growing in acceptance. As wider choice makes selection of the proper pump drive a knotty problem for plant designers, they're turning to computers to analyze plant designs of the future. For a penetrating look at the increasingly complicated pump drive picture, see p 68.

Steam turbines drive the boiler-feed pumps in a new 200-Mw unit at Niagara Mohawk's Huntley Station. The turbines replace motors, which would have consumed 2.5% of salable output. Other advantages: speed, flexibility, and fewer pump stages (p 68).

Neither frost, moisture, nor blowing dust could damage Dalles Dam units this winter, thanks to a giant vinyl-coated nylon tarpaulin which protects the open end of the plant. With this relatively inexpensive and almost tearproof covering, it was possible to run main generators and work inside the incomplete structure (p 74).

Commonwealth Ed uses 500-kw mobile generator to maintain service for three days when a substation was out for maintenance (p 76).

TRANSMISSION ▶ **How can you simplify the job of pulling cables across a river?** This usually difficult task was accomplished easily by Detroit Edison recently when it floated eight cables across Rouge River on oil drums. For an illustrated step-by-step description, see p 74.

DISTRIBUTION ▶ **Dallas' hugh Exchange Park boasts of a 13.2-kv distribution system** with efficient duality of service. The system, which will serve 15,000 people when the $125-million, 130-acre commercial development is completed in 1960, features a 26-Mva load, high reliability, adequate provision for growth, and economical installation and operation (p 77).

A hot-line tapping chamber for aerial cable, designed and soon to be tested by Long Island Lighting Co, may be the key to wider use of aerial cable. Description and drawings of the new tapping chamber are on p 72.

BUSINESS ▶ **Recession, yes; but depression, no.** That's the prognosis of 1958 business conditions by McGraw-Hill's Dept of Economics. High personal income, easier credit, and falling inventories should add up to a second-half recovery—even without the boost of a tax cut. EW estimates total '58 kwhr sales will rise by about 2½% over last year, but industrial sales seem doomed to fall off by more than 3% (p 111).

SELLING ▶ **Highlight of Wisconsin P&L's new promotion is humidity control** air conditioning. Reason: Customers can use it almost all summer, whereas air cooling alone is used only about 600 hours during the season (p 98).

MANUFACTURERS ▶ **Britain slates two 550-Mw boilers, reportedly the world's largest,** for installation in CEA's projected $112-million steam plant near Doncaster. Each giant-sized unit is rated to deliver 3,750,000 lb of steam per hr at 2,400 psi; 1055/1055F . . . John A. Roebling's Sons new Trenton plant addition, just completed, aims at increasing production of paper-insulated cables (p 79).

NEW EQUIPMENT ▶ **New expulsion load interrupter can break magnetizing and load currents** with arcing times of 1.5 cycles or less. Rated 600 amp at 15 kv, interrupter can be used on hookstick-operated or horizontal break switches . . . A porcelain-enclosed cutout just introduced enables doors to be installed or removed from any angle with standard hookstick . . . A weather protected boiler feed pump motor is now available. It comes in ratings from 250 to 1,500 hp. Ventilation system excludes air-borne particles (p 88).

PEOPLE ▶ **In top executive changes, Long Island Lighting** makes Edward C. Duffy and Howard B. Wakeman senior VP's, and ups William Welch, Jr, to VP-engineering . . . George M. Brunzell assumes new post of executive VP at Washington Water Power (p 115) . . . Simplex Wire & Cable ups G. J. Crowdes and John M. Murray . . . Clinton G. Gerlach is elected president of Penn-Union Electric Corp (p 116).

Conductor economy for a single-circuit transmission line operating at a voltage level, where corona or radio interferences determine conductor size, will be greatest where each conductor is sized for its individual position. Thus, for 230-kv H-frame construction a middle phase conductor of 954 MCM would match 795 MCM outside conductors. **—J. E. Jones, Ontario Hydro Research News, July-Sept 1957.**

Compulsiveness, intelligence, visual imagination, controlled imagination, and spirit of rebellion are necessary elements of creative engineering. To be used effectively they should appear not only in combination but in balance. There is no clear dividing line between people who are creative and people who are not creative. However creativity can be identified in an individual at a relatively early age so that proper education can best develop the individual's creative talent.— **G. J. Spencer, Mechanical Engineering, Feb 1958.**

TECHNICAL NOTES

Railroad electrification loads should probably be served from the transmission system rather than the subtransmission system. This would limit unbalance voltages on other customers equipment and concentrate the problem, if any, at generating stations where remedial action can be taken more easily.

Using probability calculations to obtain capability duration curves is difficult with hydro units because they exhibit a variable output which is not completely predictable. In addition, it is not complete random chance when several hydro units are involved because variations are not independent.

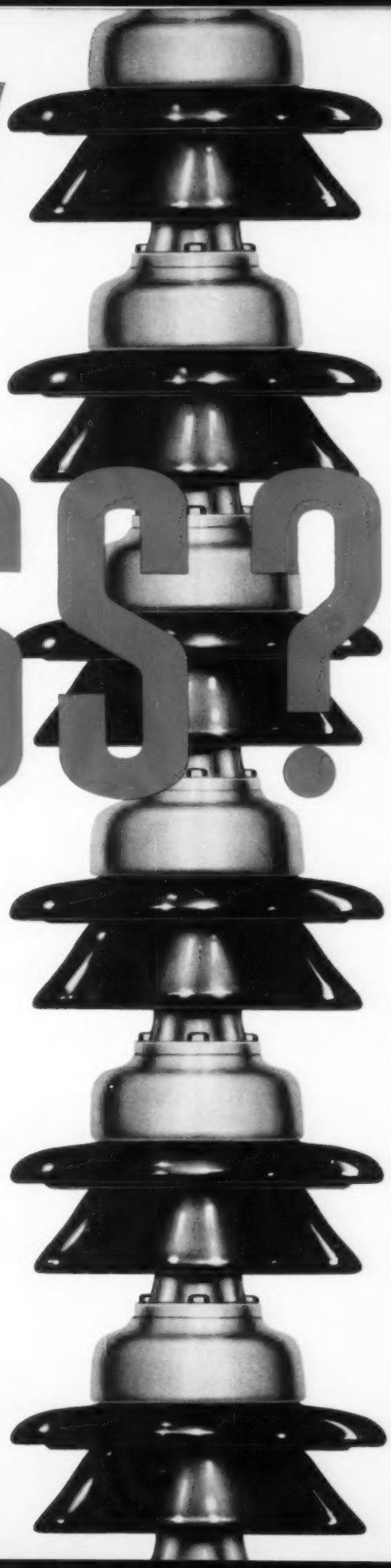
Gas turbines with capacities up to 100 Mw are ultimately possible. There is enough accumulated experience now to build a 50-Mw gas turbine having the same space requirements as a 20 to 30-Mw unit.

Adding magnesium sulphate (Epsom salts) to Bunker C fuel oil inhibits vanadium corrosion, one of the disadvantages that must be considered when using residual fuels in gas turbines.

FROM EDITORS IN THE FIELD

Pulls of three, 1,500-MCM conductors in excess of 4,000 ft for 120-kv pipe-type cable are feasible. Baltimore Gas & Electric Co construction crews, "mouse" the pipe prior to pulling, using 15 gal of oil. Then they pump about 15 gal of oil over cables during first half of pull, paying particular attention to smooth bends in all planes of pipe during installation.

WHY GUESS?



when you have THE FACTS to prove O-B is the best buy in station insulators

Why take *anybody's* word for it?

Right in your own office you have the facts of station insulator performance -- when installed -- replacements, if any -- reasons why.

Since all such insulators cost about the same, durability is the real measure of value.

If your experience is typical, O-B will show a definite advantage to you. And remember, switchgear manufacturers will supply the insulator of your choice, *providing you express that choice.*

In ordering new switches or "package" substations, specify O-B insulators by name. Your own records will amply justify this slight extra trouble.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

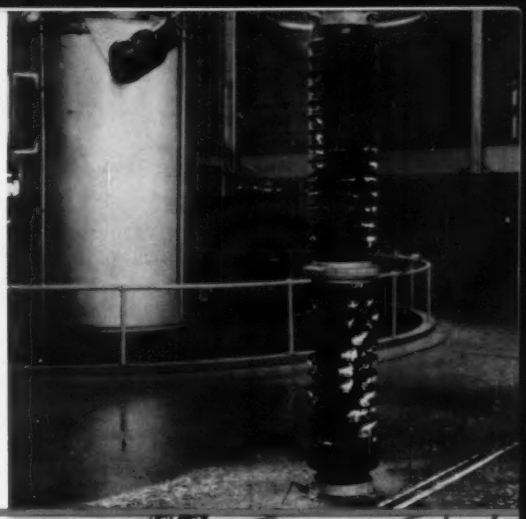
SINGLE-UNIT HOUSING

Newest Development in High-Voltage Lightning Arresters

...YOURS ONLY IN THOREX DYNAGAP

Contamination Resistance

One electrically-continuous insulated housing from line to ground confines leakage currents resulting from contamination entirely to the outside surface. This simple, basic Thorex improvement effectively combats the destructive action of stray currents entering the sensitive protective circuit at intermediate points, via the end caps of stacking units. Such unit type construction has always characterized high voltage arresters -- prior to the revolutionary Thorex single-unit housing design.



Construction Economy

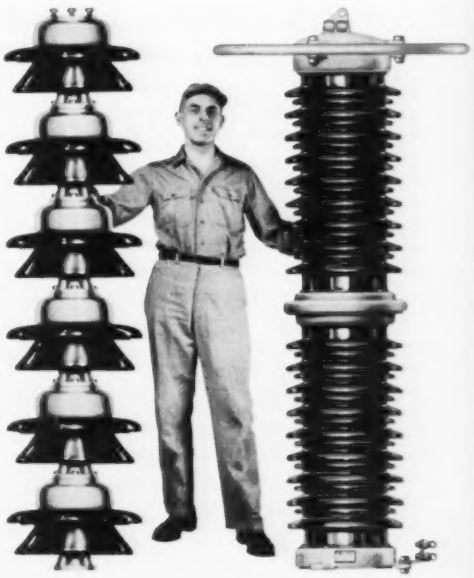
Single-unit, high voltage Thorex Dynagap arresters are manufactured, shipped, and installed in one light-weight piece. Erection time is negligible. No external bracing or support is required at any voltage. Regular pedestals or other inexpensive, standard mounting bases are adequate for all ratings. Construction economy resulting from these new Thorex features will often defray the cost of the arrester, compared to previous elaborate, expensive practices.

Small as an Insulator Stack

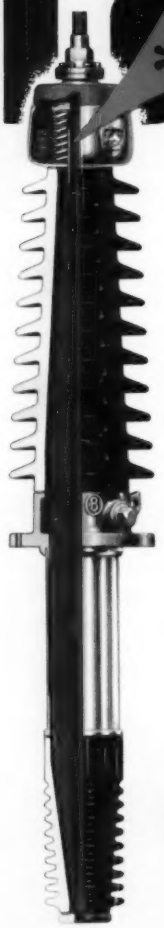
Small-size, efficient Dynagap elements permit radical miniaturization of high voltage lightning arresters. Today, the Type MPR Thorex corresponds in both height and diameter, to the dimensions of a comparable switch insulator stack. Grading rings, used only above 182-kv line-to-ground ratings, are a mere 38½-inch diameter. Wherever an insulator stack can be placed, you can now install a lightning arrester -- right within steelwork if desired. Station area and construction cost may be benefitted by important savings, plus an element of convenience heretofore unknown.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass



Bushing Insurance



INSULATING SLEEVE PRESERVES LIFE OF COMPRESSION SPRING ASSEMBLY . . . ADDS TO DEPENDABILITY OF O-B BUSHINGS

This sleeve is life insurance for your bushings. Here's how it works, and why it's so valuable.

Assembly of the bushing -- its strength, its air and moisture seals, its ability to recover from mechanical shock -- therefore, its very life, all depend upon the force exerted by the compression springs contained in the oil reservoir. Every make of bushing utilizes some adaptation of this basic spring compression assembly principle.

These springs are tempered steel -- an electro-magnetic metal -- in a magnetic field. The inherent heating effect is largely offset by nesting the springs external to the conductor, thereby preventing a closed magnetic circuit. But, these springs offer a current path in parallel with the conductor. They can carry a fraction of line current -- a duty for which they are poorly adapted, and which can produce heating, accompanied by slow annealment and ultimate loss of proper spring force.

By insulating the bottom of the reservoir from the conductor with a sleeve, current can flow only through the conductor. The springs are not a part of the load current path. There is nothing to cause heating.

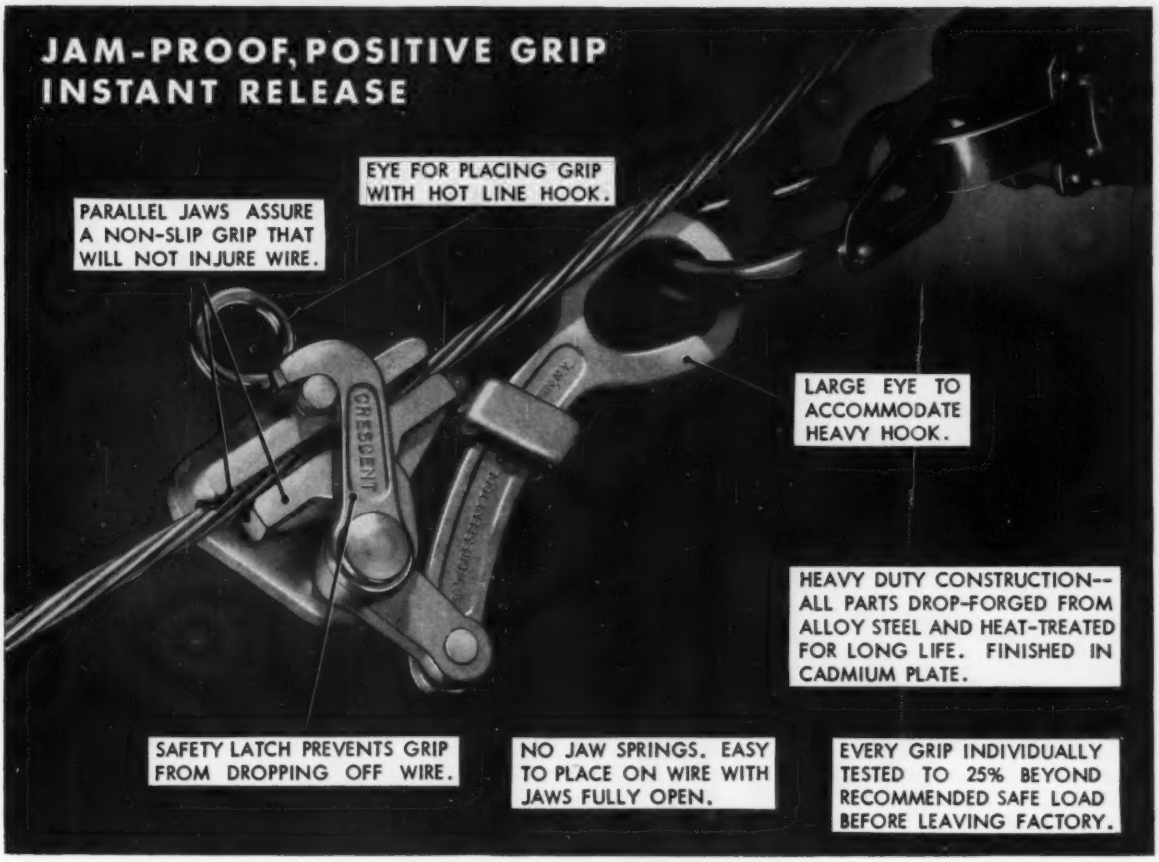
This may seem like a small detail. Actually, it is only one of many details O-B has learned in 50 years of successful bushing manufacture -- one of the details, when all added-up, that account for the uncommon reliability you've learned to expect, and consistently find, when you specify O-B bushings on your station apparatus.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4896-H

CRESCENT WIRE GRIPS


JAM-PROOF, POSITIVE GRIP
INSTANT RELEASE
EYE FOR PLACING GRIP WITH HOT LINE HOOK.
PARALLEL JAWS ASSURE A NON-SLIP GRIP THAT WILL NOT INJURE WIRE.
LARGE EYE TO ACCOMMODATE HEAVY HOOK.
HEAVY DUTY CONSTRUCTION-- ALL PARTS DROP-FORGED FROM ALLOY STEEL AND HEAT-TREATED FOR LONG LIFE. FINISHED IN CADMIUM PLATE.
SAFETY LATCH PREVENTS GRIP FROM DROPPING OFF WIRE.
NO JAW SPRINGS. EASY TO PLACE ON WIRE WITH JAWS FULLY OPEN.
EVERY GRIP INDIVIDUALLY TESTED TO 25% BEYOND RECOMMENDED SAFE LOAD BEFORE LEAVING FACTORY.
CRESCENT

SPECIFICATIONS

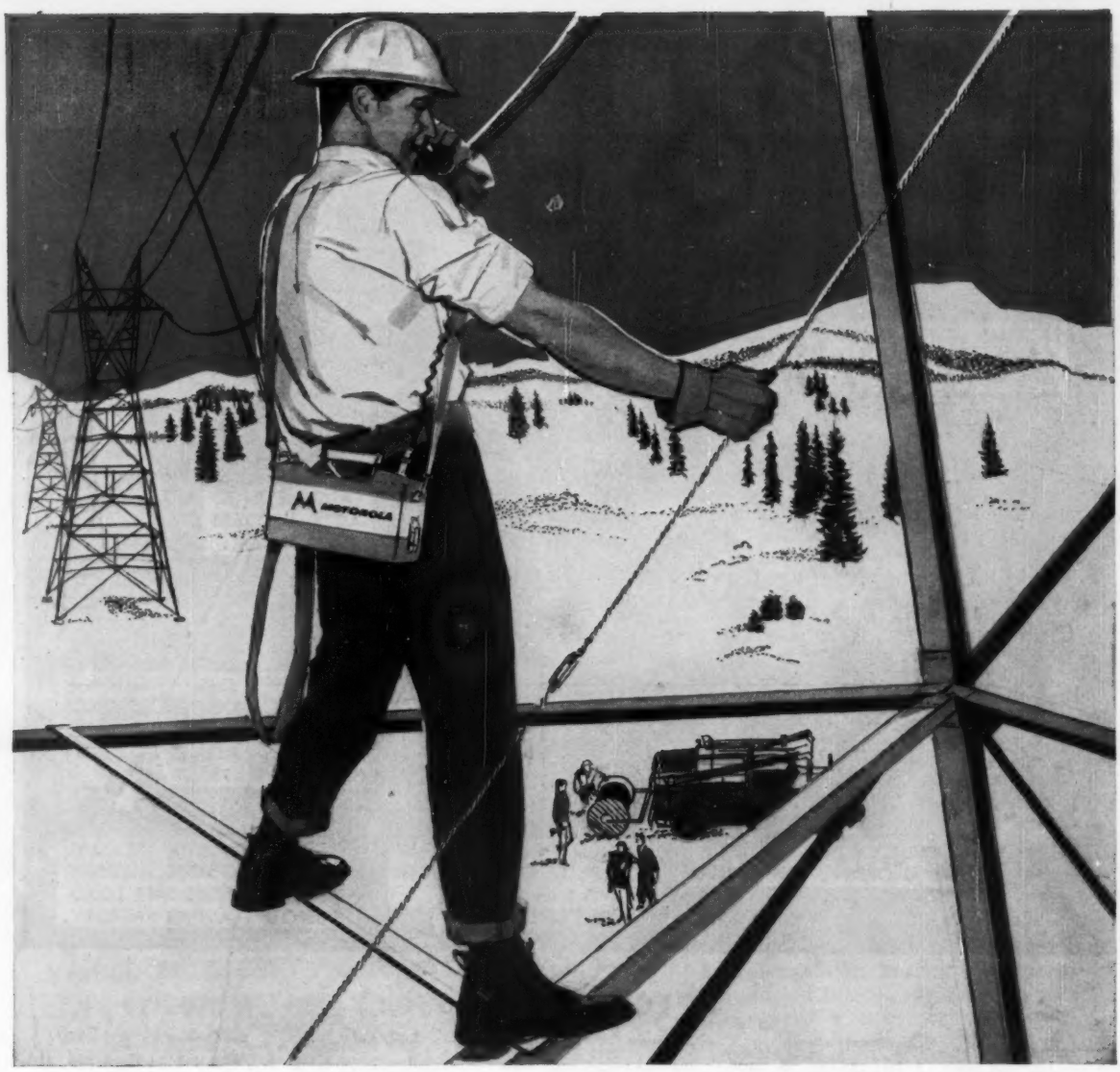
Number	*Maximum Capacity*	*Minimum Capacity*	*Safe Load*	*Eye Opening*	*Weight*
383 —Serrated Jaws	5/16 (.3125)" 8 mm.	—5/32 (.156)" 4 mm.	5,000 lbs. (2200 KG)	1-1/8" x 1-11/16"	1-3/4 lbs.
383-2—Same, except with smooth jaws for aluminum wire.					
384 —Serrated Jaws	1/2 (.500)" 12.2 mm.	—1/4 (.250)" 6.5 mm.	7,500 lbs. (3400 KG)	1-1/4" x 1-3/4"	3-5/16 lbs.
384-2—Same, except with smooth jaws for aluminum wire.					
385 —Serrated Jaws	3/4 (.750)" 19 mm.	—3/8 (.375)" 9.5 mm.	10,000 lbs. (4500 KG)	1-1/4" x 1-3/4"	4-7/8 lbs.
385-2—Same, except with smooth jaws for aluminum wire.					
386 —Serrated Jaws	1-1/16 (1.0625)" 27 mm.	—9/16 (.5625)" 14.5 mm.	12,500 lbs. (5600 KG)	1-5/8" x 2-3/8"	9 lbs.
386-2—Same, except with smooth jaws for aluminum wire.					

For bare and insulated wire, use serrated jaw style. For bare aluminum wire only, smooth jaws.

Write for Crescent Catalog No. 28 which illustrates and describes many valuable tools for linemen and other electrical workers.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK



"Almost every day we find new jobs for 2-way radio"

SAYS HARRY M. LEWIS, SUPT. OF COMMUNICATIONS, CALIFORNIA OREGON POWER COMPANY

Over canyons, streams and mountains, as well as in heavily populated urban areas, Motorola 2-way radio is helping The California Oregon Power Company construct and maintain electric service *faster, more efficiently* and at *less cost.*

The giant radio network of 16 base stations, 90 mobile sets, and 31 HANDIE-TALKIE® portable radiophones is used by practically every outside working team.

Superintendents and other key men are freed from their desks—can be reached on the job or in their cars. Survey parties and wire stringing crews use HANDIE-TALKIE portables to communicate, spanning long reaches faster and better—saving *hundreds* of dollars every day. Repair crews are more productive—get lines back in operation faster, keeping customers better satisfied. Line patrols in tractors and helicopters work safer and more efficiently with radio.

Whatever the job—Motorola 2-way radio can help you speed it at less cost. Specify Motorola for the most dependable, uninterrupted mobile communications. For a Motorola communications specialist on Power Utility problems—write, wire, or telephone.

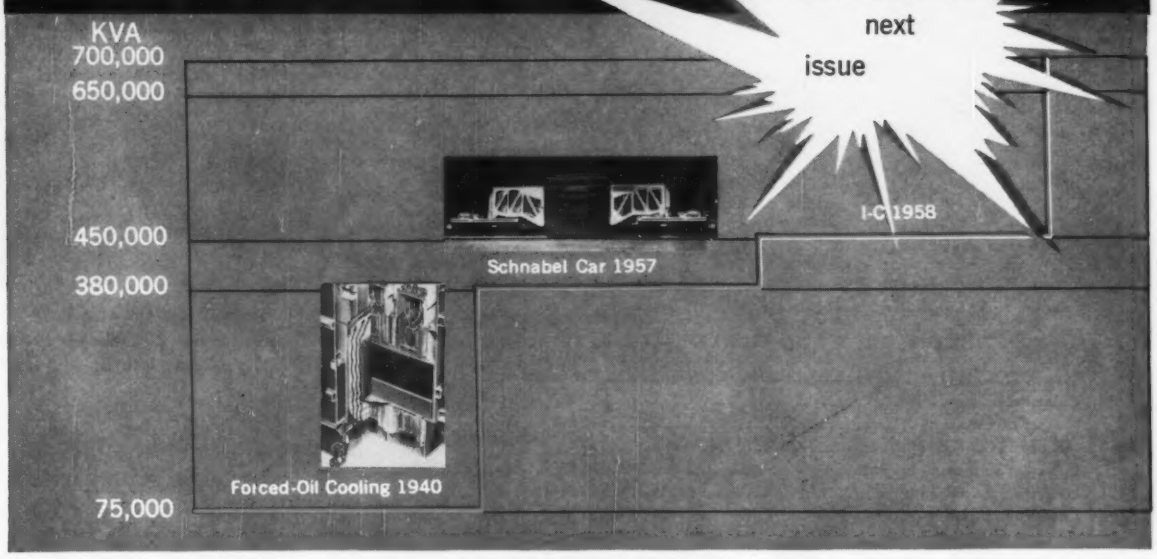
MOTOROLA *2-WAY RADIO*

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC. • A Subsidiary of Motorola, Inc. • 4501 Augusta Blvd. • Chicago 51, Illinois

Plowback of Earnings into research
for new designs and materials
helps Westinghouse develop

THE THIRD* MAJOR BREAKTHROUGH IN POWER TRANSFORMER DEVELOPMENT

see announcement next issue



J-70867

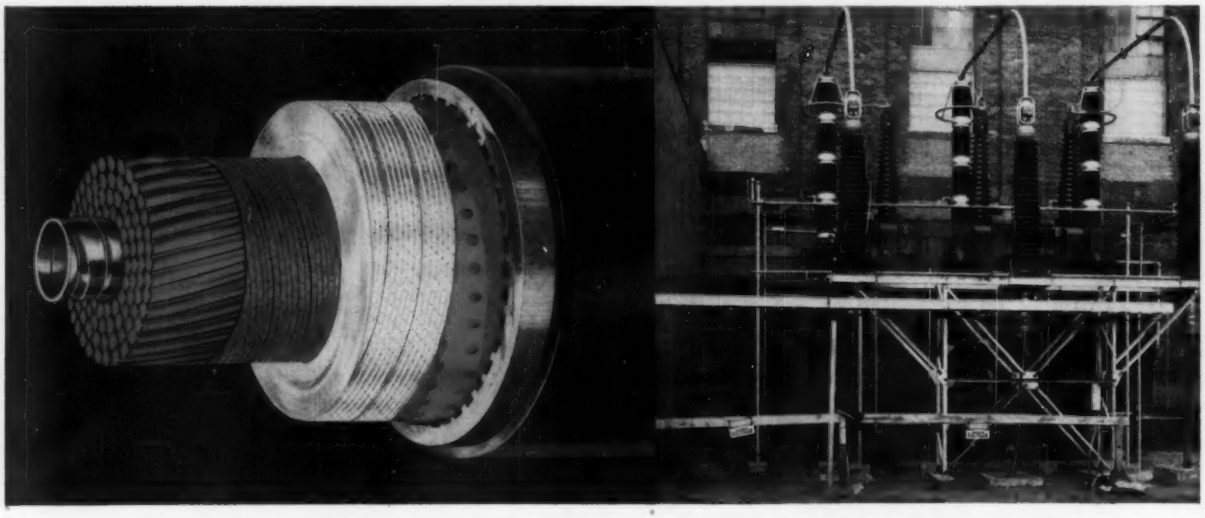
*ALL THREE FROM WESTINGHOUSE!

Watch for the THIRD MAJOR BREAKTHROUGH announcement . . . in next issue

YOU CAN BE SURE...IF IT'S Westinghouse

MADE BY PHELPS DODGE FOR NIAGARA MOHAWK...

FIRST LOW-PRESSURE, OIL-FILLED IN UNITED STATES NOW IN



Cable terminus at one end is power plant in which new 200,000 KW generating units are located.

CIRCUIT DATA AND CABLE RATING

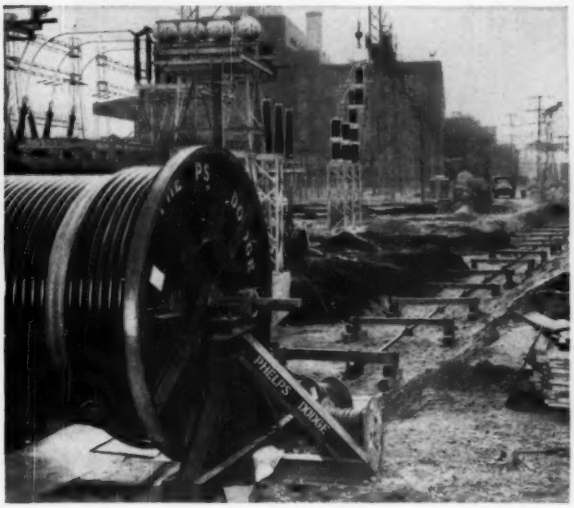
Type	Low-Pressure, Oil-Filled to AEIC 5th Edition
Cable Rating (nominal)	230 KV
Number of Circuits	2
Number of Cables	7
Capacity, each circuit (at 95% daily load cycle)	240,000 KVA
Length, each circuit (approx.)	1,500 feet
Cable construction	
Steel spiral hollow core I.D.	500 mils
Conductor concentric copper	1,250 M.C.M.
Impregnated wood pulp paper (nominal thickness)	835 mils
Habirloy arsenical fluted lead sheath (lead over flutes)	160 mils
Habirlene (polyethylene) jacket	115 mils
Maximum operating oil pressure	16 psi
Type CC oil reservoir each end, each cable	21 gals.
Maximum conductor copper temperature	
Normal	70° C
Emergency	75° C
Potheads G & W type, ATL, low-pressure, oil-filled	230 KV
Installation, buried concrete trough and cover, (spacing between cables)	10 in.

230 KV CABLE SERVICE

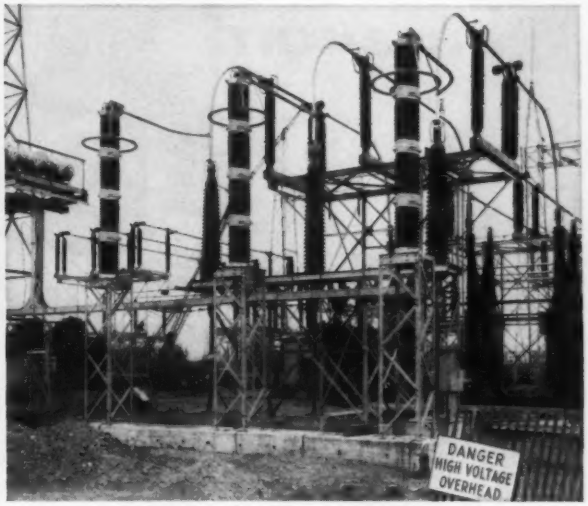
The first 230 KV low-pressure, oil-filled power cables for use in this country—made by Phelps Dodge Copper Products Corporation—were recently placed in service at Niagara Mohawk Power Corporation's Charles R. Huntley Station near Buffalo. The cables were installed by direct burial, a new method of laying cable of this voltage in the U.S. An unusual feature of the cable design was the selection of a protective jacket of corrosion-proof polyethylene for use over the cable's lead sheath.

The cables will integrate new generating units into the Niagara Mohawk System by linking the main step-up power transformers to the 230 KV switchyard. Three single conductor cables are assigned to each of the two circuits, together with one spare cable. All cable lengths are continuous without splices.

The selection of Phelps Dodge to manufacture these cables—the vital link in the 230 KV system—is indicative of the confidence placed in Phelps Dodge's practical experience and reputation in pioneering the widest range of power cables in the industry.



Pulling cable into ditch for direct burial. In final stage, cable was seated in a sand-filled trench. Concrete slabs were placed above the sand for mechanical protection.



Switchyard, view showing cables terminated in potheads with gravity reservoirs in position on tower.

PHELPS DODGE COPPER PRODUCTS CORPORATION

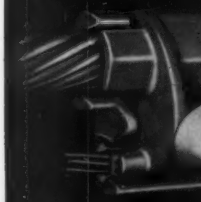
300 PARK AVENUE, NEW YORK 22, N. Y.

Connect
COPPER with COPPER
ALUMINUM with ALUMINUM
use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1 0 Cu. 6—2



*PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4 / 6—1 0 A R Cu. 8—1 0

BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

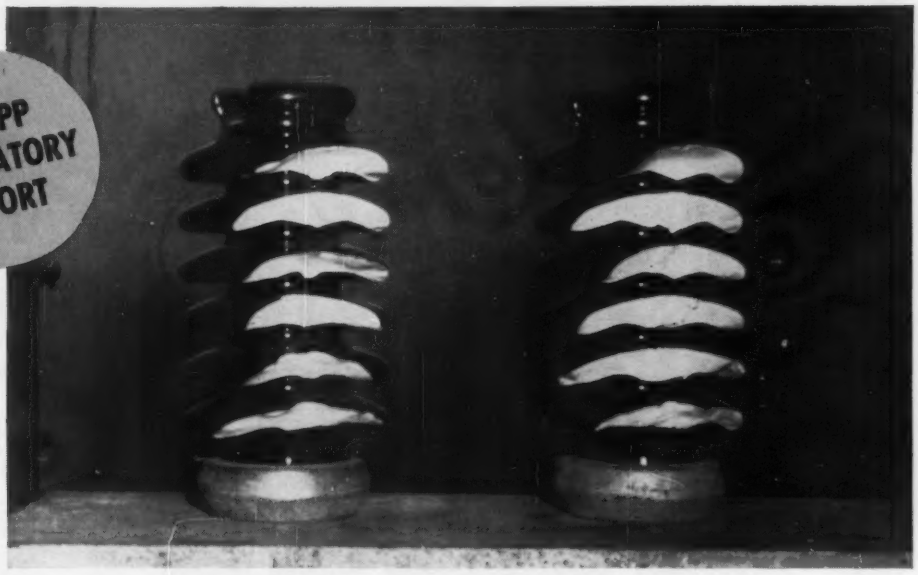
Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

1525 WOODSON RD. • ST. LOUIS 14, MO. • PHONE: WYdown 3-9430

A LAPP LABORATORY REPORT



BROKEN CORRUGATIONS...

how do they affect performance?

THE PROBLEM: It is well known that mechanical damage to the Lapp Line Post insulator causes much less loss of its electrical characteristics than does such damage to pin-type or suspension insulators. Good maintenance on a system generally does call, however, for changing out insulators that show sign of damage. How urgent is it to replace insulators reported as being damaged? The answer, of course, involves security of the system as well as economy of maintenance, and can be found only in evaluation of characteristics.

THE TEST: Utility engineers whose company operates a large system on Lapp Line Posts wished to set a standard procedure for Line Post maintenance. They visited the Lapp plant and had us make laboratory tests of 35 kv Lapp Line Posts, measuring dry and wet flashover value with petticoats progressively broken off. (We used a hammer to simulate mechanical damage in the field.)

THE FINDING: With the top petticoat broken off, dry flashover was reduced less than 1%, wet flashover by slightly less than 4%. With all six petticoats gone (as shown in the photo) flashover tests showed a loss of 7% in both dry and wet 60-cycle flashover. (In a similar test made previously, we found loss of all corrugations reducing wet flashover somewhat more—apparently the exact pattern of the break has an important effect.)

THE CONCLUSION: The strong post body of the Lapp Line Post remains intact, and an insulator with all petticoats broken will handle normal operating conditions. Loss of one or two corrugations poses no urgency whatsoever. The company for whom this test was made will replace insulators so damaged only when convenient.

THE MORAL: Use Lapp Line Posts on your system for distribution and subtransmission up to 88 kv. They'll give you an extra margin of operating security, low maintenance cost and long life.

Lapp Insulator Co., Inc., LeRoy, N. Y.

"THE ONLY EXTRA WAS IN THE CAPACITY"

When Detroit Brewer Powered-Up with New Type LD Transformers

When The Stroh Brewery Company of Detroit needed extra electrical capacity for their bottle shop, consulting engineers Harley, Ellington and Day recommended that they POWER-UP their private "substation on a rooftop." In the past, Stroh would have been faced with the almost certain expense of expanding their substation area and increasing structural reinforcing of the roof to accommodate larger and heavier transformers.

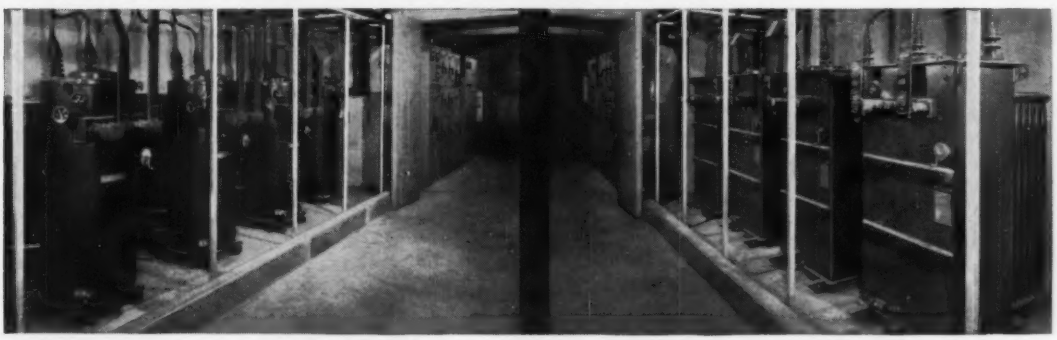
But new Westinghouse Type LD transformers are smaller and lighter. Their new circular design, with the coolers on the back only, saves up to 37% in width and base area over a Westinghouse Type SL unit of the same rating. The three 250-kva Type SL's which the brewery had outgrown were replaced with three 333-kva Type LD's—and *no extra space was needed.*

The weight problem, too, was eliminated by the compact design. Cooling oil weight is reduced over comparable Type SL units, with an overall weight reduction up to 27%. *No extra reinforcing was necessary* for the higher ratings installed in this rooftop site.

As a Stroh spokesman said of the installation: "No extra space; no extra reinforcing; the only extra was in the capacity."

* * *

Call your Westinghouse representative for the full story of how the new, streamlined Type LD transformer can help solve *your* customers' space and weight problems . . . and help them POWER-UP with capacity for their growing demands. J-70863



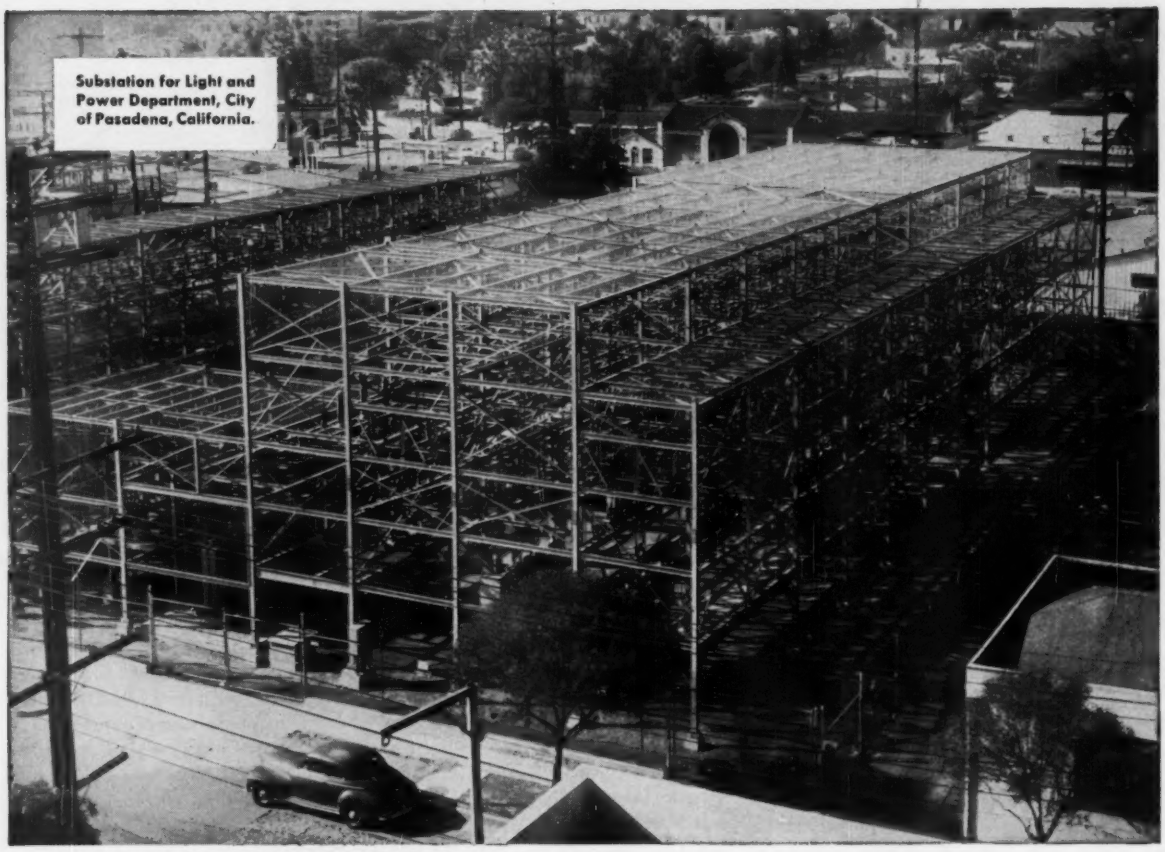
▲ NO EXTRA SPACE WAS NEEDED when these 333-kva Westinghouse Type LD transformers, on the left, replaced three 250-kva Type SL units similar to the units installed at right.

◀ Circular design tank and core-coil assembly are contour-fitted to provide maximum capacity in minimum space. New Lowgrocap* windings provide maximum impulse strength.

*Trade-Mark

YOU CAN BE SURE...IF IT'S

Westinghouse



Substation for Light and Power Department, City of Pasadena, California.

13.2 KV/240 volt transformer substation for Mayville Metal Products Company, Mayville, Wis.

LARGE or SMALL

All 3E Substations get personalized design.

Custom design . . . Not customary equipment is the key to high efficiency at low cost. Substations designed specifically for the job are in close accordance with ideal engineering practice. They deliver maximum service at minimum cost and are free from hazardous short cuts or the unnecessary costs due to standardized procedures. 3E's knowledge of structural design and pre-fitted parts allows rapid erection at low labor costs and lengthens service life.

The advantages of personalized service . . . With 47 years experience concentrated on substation and switchgear, 3E's engineering staff is ideally suited to help you get the best design and equipment for your needs.

Whether you invite bids from a rough sketch or complete specs, 3E can offer a complete service, a fine design staff, a full line of indoor and outdoor switchgear and a modern plant capable of a wide range of custom fabrication.

3E

ELECTRICAL ENGINEERS EQUIPMENT CO., MELROSE PARK, ILL.
Representatives in principal cities

"forget PENETROX? impossible... it's sealed into the Burndy TAPIT!"

"Any lineman who uses Tapits will tell you they make line taps a cinch. Just abrade the aluminum conductor, strip plastic seal from the Tapit... and install!"

The aluminum Tapit body is relatively massive compared to the copper conductor—resulting in negligible electrolytic action. Because of this and other Burndy engineered features including Penetrox, the proven oxide inhibitor, utility engineers know Tapits are just as efficient in aluminum to copper applications as they are in aluminum to aluminum! Want more Tapit facts? Write Burndy, Norwalk, Connect.

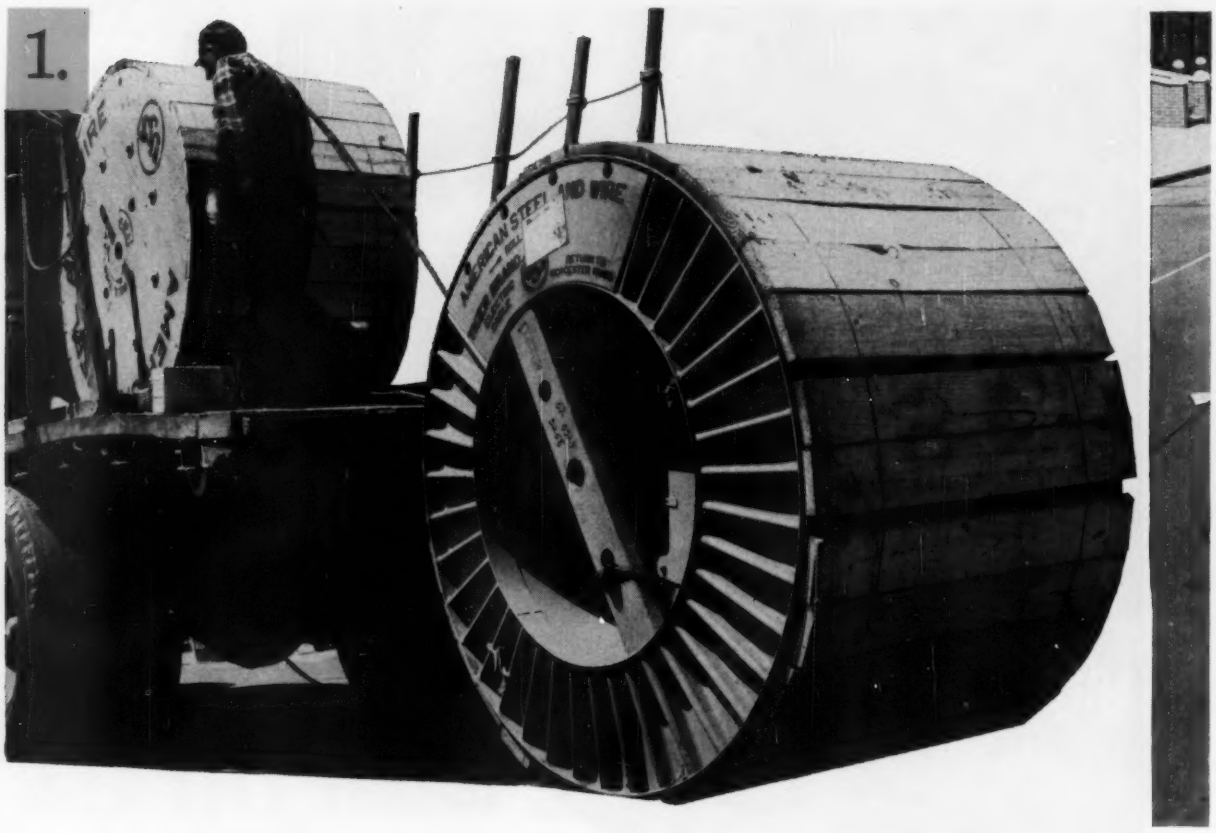
Cathodic copper conductor is small compared with large anodic aluminum Tapit—electrolytic current density on Tapit surfaces is reduced... corrosion effects are negligible.

Burndy Tapits are pre-filled with oxide-penetrating Penetrox and totally sealed in a leakproof plastic sheath. Opens fast with pull of tab!

BURNDY

67-18

NORWALK, CONNECT., SCARBORO, CANADA



Con Edison increases capacity with Tiger Brand Paper-Lead Cable

LIKE most utilities, Consolidated Edison, New York City, is rapidly expanding in an endless race to keep up with growing demand for electrical power.

The problem of old and new comes into sharp focus in the Williamsburg section of Brooklyn. It's one of the earliest settled areas of the city. Many of the houses were not designed for any electricity—let alone for refrigerators, freezers, air conditioners, automatic heating systems and do-it-yourself power tools.

The installation of the Brooklyn-Queens Expressway—a new Belt road that sliced through the heart of Williamsburg, got in the way of existing electrical conduits and relocated some Con Edison customers. Now, the utility is re-routing with new lines to avoid the expressway.

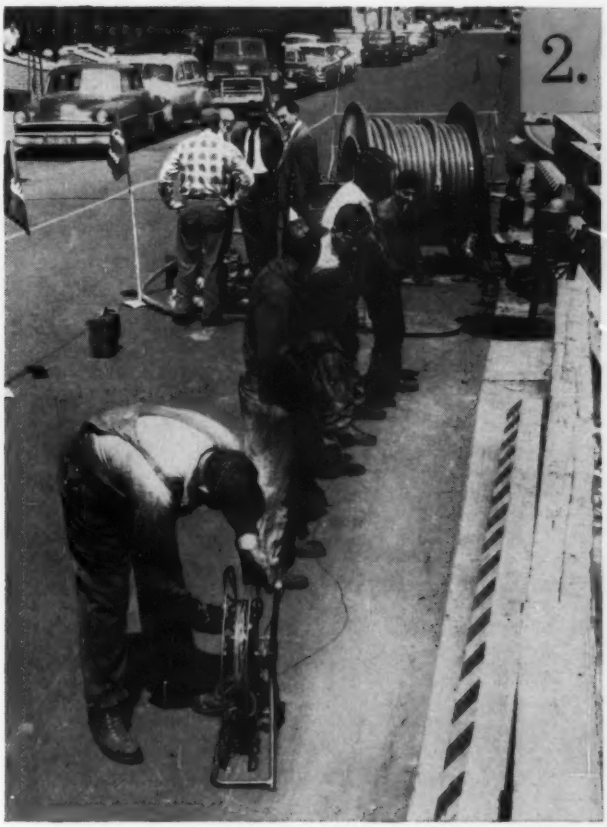
The over-all job is a massive one, and the cable is supplied by several reputable manufacturers including American Steel & Wire. In the district shown in the photographs, AS&W shipped some 12,000 feet of 2/0, 27KV, 3-conductor, paper-insulated lead-sheathed Tiger Brand cable in carefully predetermined lengths.

For high voltage feeders, Tiger Brand Paper Insulated Cable is available in solid or gas pressure types. Many special constructions are available as standard production. An inquiry detailing your requirements will receive our prompt and careful attention.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors

Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, New York

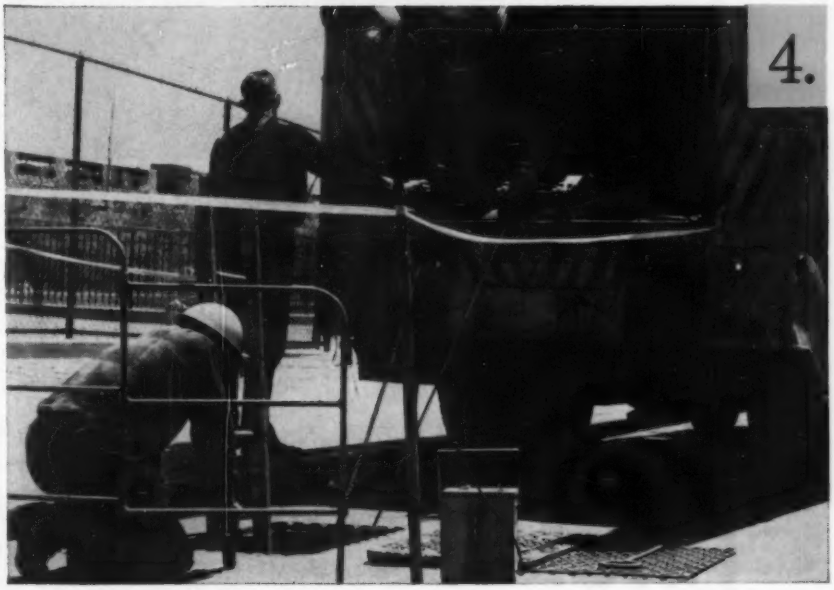


1. Reels are lowered onto street from winch truck, while workmen clean the 4-inch prefab concrete ducts.

2. Crew pulls the steel wire brushes through ducts to remove pebbles and dirt. Pull here is 393 feet.

3. Cable is heavily lubricated with special pulling compound before it goes into the baloney.

4. Winch truck begins pull, maintaining a 20-foot-per-minute rate.



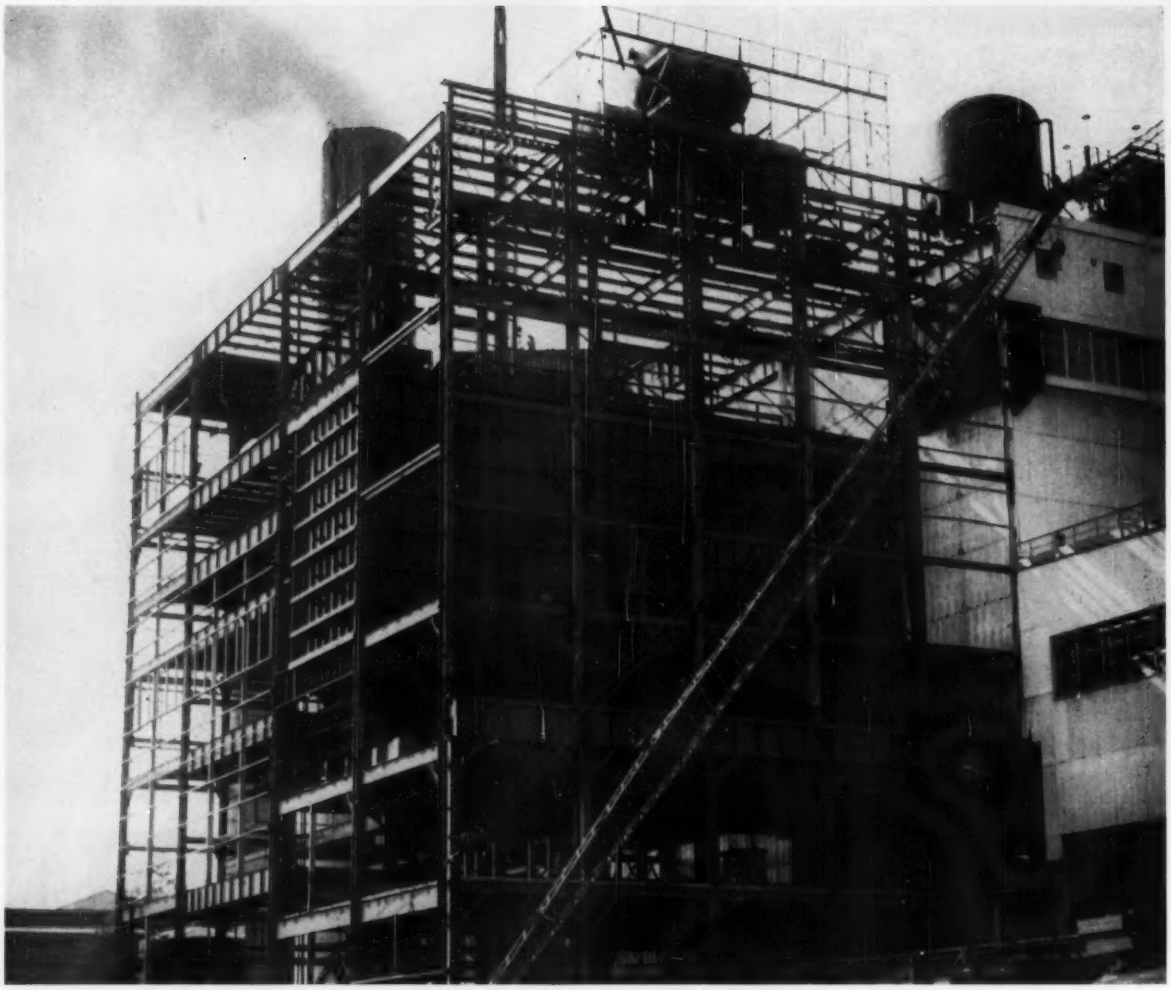
USS TIGER BRAND ELECTRICAL WIRE & CABLE

a standard Tiger Brand Cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

UNITED STATES STEEL

USS TRADEMARK



Another POWER HOUSE EXPANSION FABRICATED AND ERECTED BY INGALLS

Plant Alabama Power Company, Gorgas, Alabama
Engineer Southern Services Incorporated, Birmingham, Alabama
Steel Fabricator The Ingalls Iron Works Company
Erector The Ingalls Steel Construction Company
Platework Birmingham Tank Company

When the Alabama Power Company planned to expand its Gorgas Plant, INGALLS' team of power house specialists were called in to fabricate and erect the structural steel for Units No. 8 and No. 9. Now under construction, Unit No. 9 of the plant is another example of the combination of experience, skill, and specialized knowledge with which INGALLS serves the electric power industry.

Forty-six of the nation's leading power companies have called on INGALLS to fabricate or fabricate *and* erect the structural steel for their new plants.

If your company is planning to expand its power plant facilities, call on specialists in power plant structural steel fabrication and erection - INGALLS.

THE
INGALLS
IRON WORKS
COMPANY
Executive Offices
BIRMINGHAM, ALABAMA

INGALLS INDUSTRIES ARE:
The Ingalls Iron Works Company, Sales Offices: New York, Pittsburgh, Chicago, Houston, New Orleans, Atlanta • **The Ingalls Steel Construction Company,** Sales Offices: New York, Chicago, New Orleans, Pittsburgh, Houston, Atlanta • **Birmingham Tank Company,** Sales Offices: New York, Pittsburgh, Chicago, Atlanta, New Orleans, Pascagoula
The Ingalls Shipbuilding Corporation, Shipyards: Pascagoula, Mississippi; Decatur, Alabama Sales Offices: New York, Chicago, Washington, Houston, New Orleans, Atlanta

330,000 volts

transformers for Kariba

The contract awarded to Ferranti Ltd. by the Federal Power Board for the great Kariba Hydro-Electric Scheme on the Zambesi River covers two 120,000 kVA 330/234 kV 3-phase auto transformers with separate boosters; eight 60,000 kVA 330/88 kV 3-phase double-wound transformers; and two 60,000 kVA 330/33 kV 3-phase double-wound transformers. All the transformers will be provided with on-load tap changing gear. The placing of this large and important overseas transformer contract emphasises the world-wide confidence in Ferranti Ltd. as builders of fine transformers.

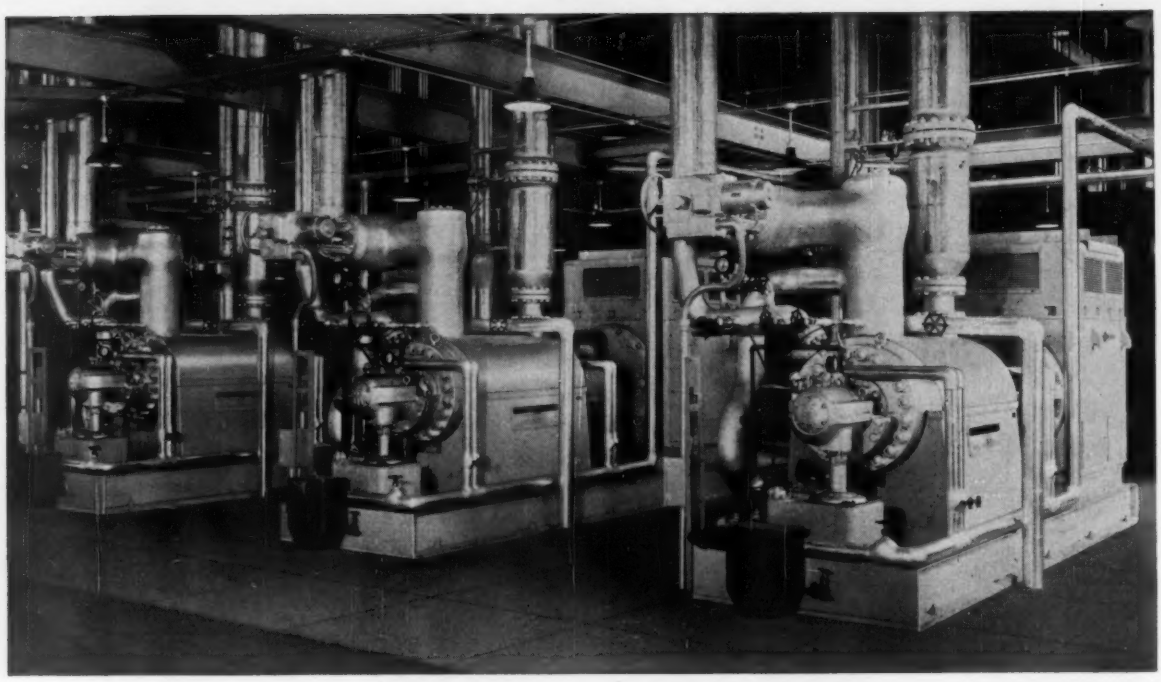
FERRANTI LTD

London Office: **KERN HOUSE · 36 KINGSWAY · W.C.2**
NEW YORK: Ferranti Electric Inc., 30 Rockefeller Plaza, N.Y. 20
TORONTO: Ferranti Electric Ltd., Mount Dennis, Toronto 15

Head Office: **HOLLINWOOD · LANCS · ENGLAND**

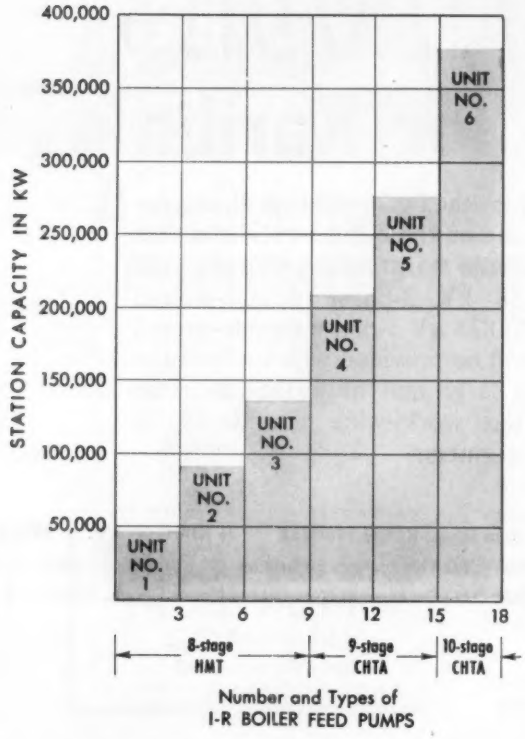
PLANTS

MOSTON: Manchester 10, England
WYTHENSHAWE: Manchester 22, England
WEST GORTON: Manchester 12, England
GEM MILL: Chadderton, Lancs., England
EDINBURGH: Ferry Road, Edinburgh 5, Scotland
DUNDEE: Kings Cross Road, Dundee, Scotland



3 MORE I-R BOILER-FEED PUMPS

serve Unit No. 6 at H. T. Pritchard Generating Station



THIS latest installation at Indianapolis Power & Light Company's H. T. Pritchard Station brings total plant capacity to 376,000 kw—served by a total of *eighteen* Ingersoll-Rand high-pressure boiler-feed pumps.

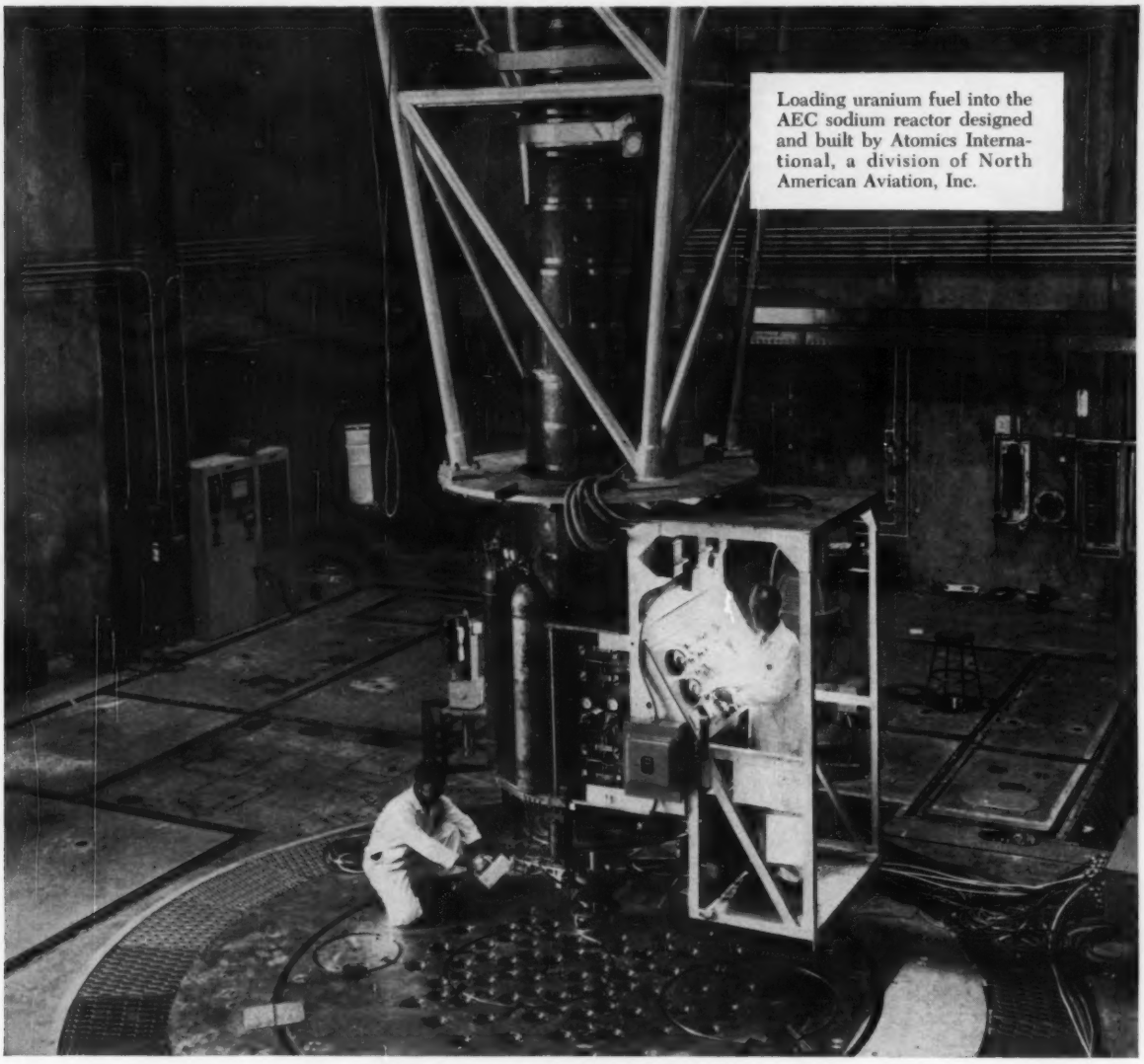
Unit No. 6 is served by the three 10-stage Class CHTA boiler-feed pumps shown above, each direct driven by a 1250 hp motor and rated 875 gpm with 4451 ft. total head. These pumps feature Ingersoll-Rand's proven double-case construction and "Unit-Type" rotor assembly. And like all I-R boiler-feed pumps at the H. T. Pritchard Station, they are designed to provide top performance and economy under the most severe operating conditions.

This is another case where I-R boiler-feed pumps have *sold themselves* over and over again, on the basis of past performance in the same power plant. For the best solution to your boiler-feed pump problems, just call your nearest I-R representative.

Ingersoll-Rand

10-677 11 Broadway, New York 4, N. Y.

COMPRESSORS • TURBO BLOWERS • CONDENSERS • PUMPS • AIR TOOLS • DIESEL AND GAS ENGINES



Loading uranium fuel into the AEC sodium reactor designed and built by Atomics International, a division of North American Aviation, Inc.

Water for new Atom Power Plant is 99.999992% pure!

● Southern California Edison Co. . . . now generating current from this new reactor in the Santa Susana Mountains . . . is the first private utility to produce electricity from a non-military reactor.

As in any system using water or steam in or near an atomic reactor, the quality of the water at the Santa Susana plant is important. Suspended and dissolved mineral solids must be removed to prevent them from depositing in boiler tubes and turbines. In other types of reactors, these solids can also pick up and carry radioactivity and could make turbines and other equipment difficult for maintenance or repair.

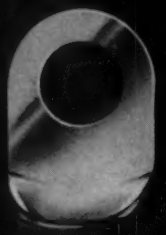
Although this plant's water supply is a clear well water, it contains almost 600 parts per million of hardness salts and other dissolved solids. The Permutit softener and demineralizer reduce these solids to 1/12 part per million . . . a purity of 99.999992%!

Permutit was chosen to design and supply this precise and critical equipment because of its long experience in water conditioning.

If your problem is Water . . . for industrial, municipal or home use, we'd like to discuss it with you. Address: The Permutit Company, Dept. EW-3, 50 West 44th St., New York 36, N. Y. or Permutit Company of Canada, Ltd., Toronto 1, Ontario.

PERMUTIT®
rhymes with "compute it"
a division of PFAUDLER PERMUTIT INC.
Water Conditioning
Ion Exchange • Industrial Waste Treatment

AMP COMPRESSION for the



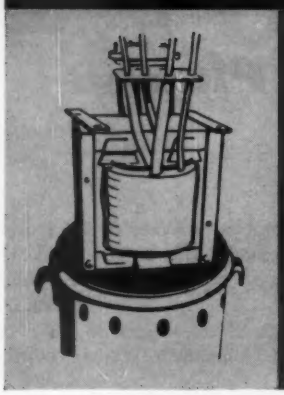
ALL TERMINALS SHOWN ACTUAL SIZE

SOLISTRAND®
22-600 MCM AWG

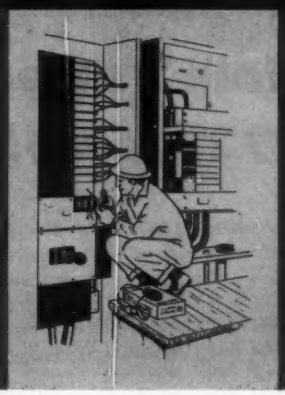
Ampli-Bond®
8-4/0 AWG

DIAMOND GRIP
26-10 AWG

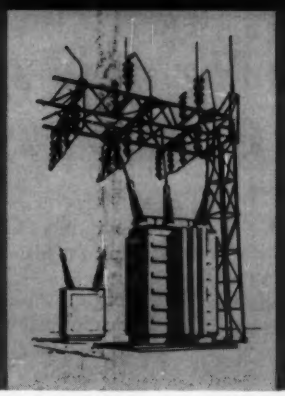
PRE-INSULATED DIAMOND GRIP
26-10 AWG



SOLISTRAND Butt and Parallel Connectors for innercoil connection to leads. SOLISTRAND Terminals on outside leads of transformers.



PRE-INSULATED DIAMOND GRIP and DIAMOND GRIP Terminals and Connectors for switchgear panel wiring in generator plants and sub-stations.



SOLISTRAND and AMPLI-BOND Terminals and Connectors for construction and maintenance of generator plants and sub-stations.

PRE-INSULATED DIAMOND GRIP and SOLISTRAND Terminals and Connectors for street and traffic light installation and maintenance.

TERMINAL PRODUCTS UTILITY INDUSTRY...

AMP's diversified lines of terminal and connector products . . . and matched precision-engineered application tooling . . . have been part of the utility industry's components story, in many ways, for many years. These products have been designed for the exacting requirements of the electrical industry in general, and a predominant number of original equipment items depend on the AMP method of termination and connection for service reliability.

AMP's diversified lines of terminal and connector products include:

SOLISTRAND®—of one-piece construction, for application to stranded, solid or irregularly shaped conductors.

Ampli-BOND®—provide full insulation support for large wire sizes. They are bonded and reinforced to prevent relaxation of cable support.

DIAMOND GRIP—non-insulated, but having metallic sheath to provide full circumferential support to cable. Excellent for applications where resistance to vibration is a factor.

PRE-INSULATED DIAMOND GRIP—insulated with tough plastic that won't come off . . . it's bonded. Affords optimum performance under vibration.

Some typical applications of these A-MP products are shown below.

AMP's continuing programs of research and development are increasing the potential of newer products to speed operations, reduce costs, and improve reliability for all phases of utility activity.

A-MP products, when required for maintenance and repair needs, are available in the U. S. A. through American Pamcor Inc. api AMERICAN PAMCOR INC.

For additional information write to:

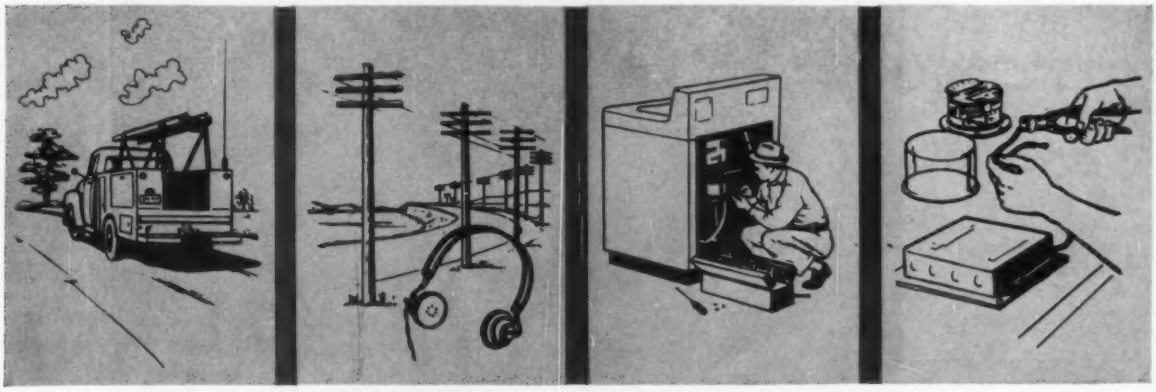
AMP INCORPORATED

General Offices:

7237 Eisenhower Boulevard, Harrisburg, Pa.

Wholly Owned Subsidiaries: Aircraft-Marine Products of Canada, Ltd., Toronto, Canada • Aircraft-Marine Products (Great Britain) Ltd., London, England • Societe AMP de France, Le Pre St. Gervais, Seine, France • AMP—Holland N.V. 's-Hertogenbosch, Holland

Distributor in Japan: Oriental Terminal Products Co., Ltd., Tokyo, Japan



PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP, and SOLISTRAND types find extensive usage in truck and car fleet maintenance.

PRE-INSULATED DIAMOND GRIP Terminals and Connectors for communications equipment.

PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP and SOLISTRAND types for appliance repairs.

PRE-INSULATED DIAMOND GRIP, DIAMOND GRIP and SOLISTRAND types for meter repairs.

BRINGING OUTDOOR MAINTENANCE INSIDE

SHELTERFOR-M* Metal-Clad Switchgear

Westinghouse SHELTERFOR-M, a new concept in outdoor switchgear, is designed to protect equipment and personnel from the weather and to provide complete comfort and safety during maintenance.

The inside work area is roomy enough to allow two breakers to pass in the aisle. Hinged panel located on the aisle provides easy access to relays, instrumentation and control equipment. Standardized construction means additional units can be added simply and quickly to meet increased loads and system expansion.

Auxiliary units can be furnished as options to serve as tool storage and battery areas, eliminating unsightly service buildings. Lighting facilities, convenience outlets and space heaters are provided.

Westinghouse SHELTERFOR-M is especially designed for modern suburbia. Clean, modern lines, coupled with paint and planting, effectively blend substations into surrounding landscapes. Compactness of design also means SHELTERFOR-M can be located on a minimum of expensive real estate without costly concrete service and drawout pads.

For full information about SHELTERFOR-M and 150-DH-1000 Circuit Breakers, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60941

From Plowback of Earnings into Research Comes Metal-Clad Switchgear with

. . . AIR CIRCUIT BREAKER HAVING 1 MILLION KVA INTERRUPTING CAPACITY

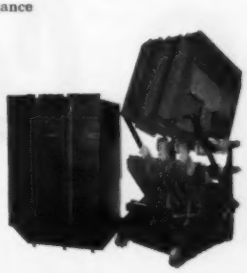
Westinghouse combines highest capacity with its exclusive De-ion® principle . . . fastest, most efficient method of arc extinction ever devised. The new H-type iron circuit creates a strong and uniform magnetic field. The blowout coil in the center in series with the arc splits the arc in two so there are essentially two interrupters in series.

Main contacts are the self-aligning multiple-line butt type. Chutes are hinged for easy access to contacts.

*SHELTERFOR-M Shelter for Maintenance

YOU CAN BE SURE...IF IT'S

Westinghouse



Another call for Collyer . . .

EASTERN PENNSYLVANIA PSYCHIATRIC INSTITUTE
A General State Authority Project
Associated Architects:
Harbeson, Hough, Livingston & Larson and Harry Sternfeld
General Contractor:
Turner Construction Co.
Electrical Engineers:
Louis T. Klauder & Assoc.
Electrical Contractors:
Electric Power Construction Co.

COLLYER CABLE helps shed new light on mental health

Already filling a vital need for intensive-care psychiatric facilities, the new, $11,600,000 Eastern Pennsylvania Psychiatric Institute will be a major force in the advancement of mental health research. In addition to its large outpatient department and self-contained children's wing, this modern hospital serves as research and teaching center for five medical schools in the Philadelphia area.

To help ensure smooth operation of its complex electrical system, thousands of feet of Collyer power and lighting cable were installed throughout all parts of the new unit. Here, as on other major projects, the "call for Collyer" has been answered with cable that meets the highest construction and serviceability standards.

It will pay you to learn more about the advantages of specifying Collyer Cable for all types of municipal or private installations.

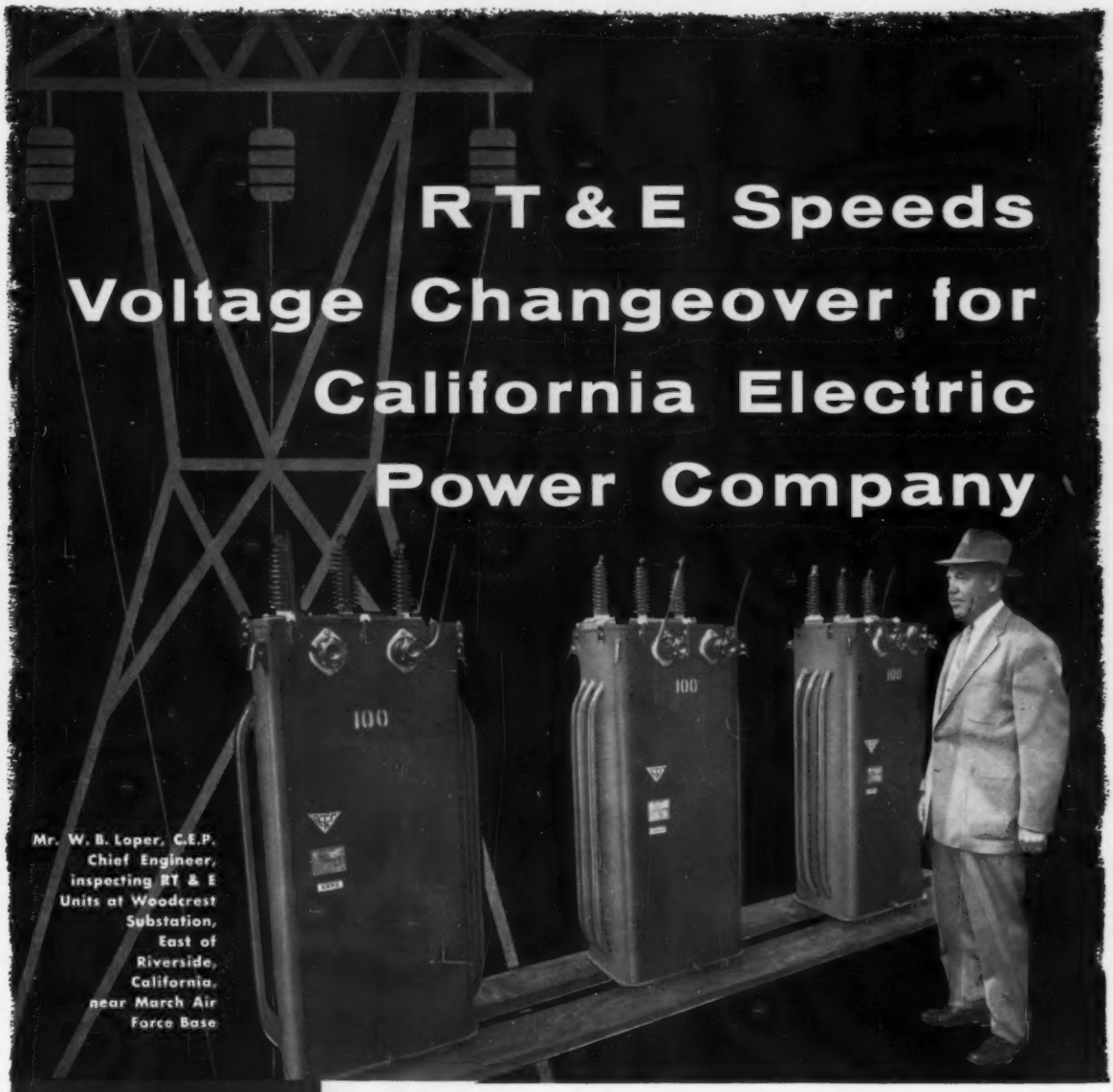
Write now for further details relating to your specific requirements. **Collyer Insulated Wire Co., 247 Roosevelt Ave., Pawtucket, Rhode Island.**

LIVE BETTER ELECTRICALLY

Collyer

Power Cables • Control Cables
Switchboard Wires • Service Cables
Series Lighting Cables • Building Wires
SALES AGENTS IN PRINCIPAL CITIES

R T & E Speeds Voltage Changeover for California Electric Power Company



Mr. W. B. Loper, C.E.P. Chief Engineer, inspecting RT & E Units at Woodcrest Substation, East of Riverside, California, near March Air Force Base

IMPULSE TESTED

R T & E CORPORATION
Waukesha, Wisconsin

Equipment to help provide power for America

California Electric Power Company faced the problem of making a rapid cutover . . . in areas served from distribution circuits of 2400, 4160, and 4800 volts delta and wye . . . to 12,000 volts.

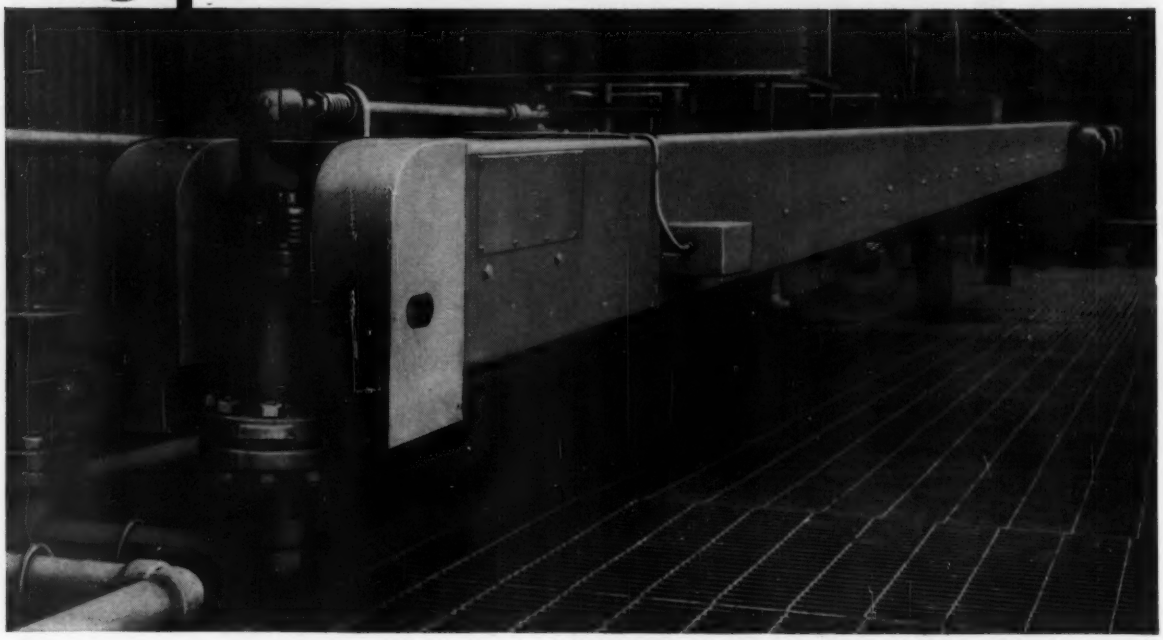
Mr. W. B. Loper, Chief Engineer of California Electric Power, found after careful study that these cutovers could be made faster and more economically if special 100 KVA transformers were available.

The problem was presented to the R T & E Engineering Department, where swift and careful attention to the problem resulted in a specially designed transformer capable of transforming all three voltages to the 12 KV level.

These special units were manufactured and delivered in record time to meet an emergency condition, saving the utility time and money. Electrical characteristics proved to be excellent, and cutovers were made on schedule.

This type of special service is another reason why R T & E Transformers are being specified by more and more utilities the nation over.

How Copes-Vulcan control systems boost power plant efficiency



38-foot travel with this Vulcan T-30 on a 1400-psig utility boiler. Write for Reprint 1040, the story of this interesting installation.

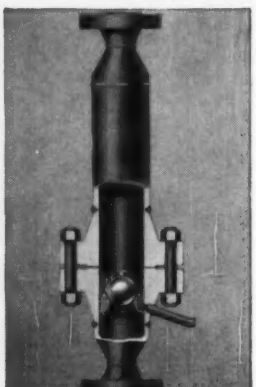
Vulcan soot blowers clean widest furnaces ...simplify maintenance

Vulcan long retractable soot blowers are products of years of experience in the utility field. A dual-motor drive permits one motor to extend and retract the lance, another to rotate it. This provides an infinite number of multi-helix jet patterns for *complete* coverage, *uniform* cleaning.

Built to withstand outdoor installations in all climates, these soot blowers feature simplicity of working parts to assure dependable operation with a minimum of outages for servicing.

One source ... one responsibility ... a complete service. Besides boiler cleaning equipment, Copes-Vulcan builds complete control systems for combustion, feed water, superheat and reheat temperatures, feed water bypass, pressure reducing and desuperheating. Whether furnished separately or integrated into a single package, each installation is custom-designed for the specified conditions. Write for Bulletin 1022-B.

Combustion control for every need. Copes-Vulcan combustion control adapts to all generating capacities, load ranges, pressures and fuels. Write for Bulletin 1032, the story of a utility installation featuring compact panel with miniature instruments.



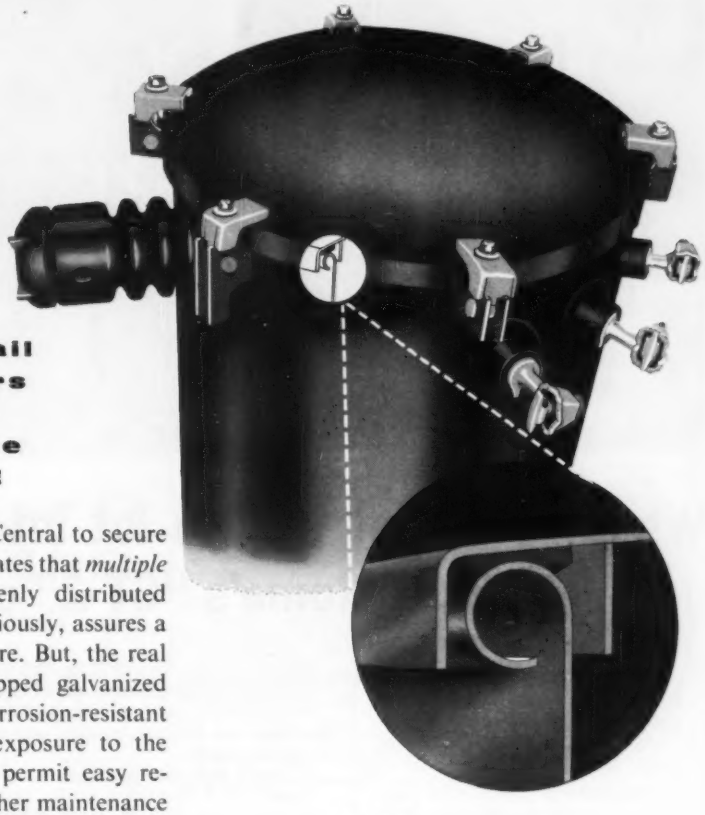
Desuperheater improves temperature control. New Copes-Vulcan Variable-Orifice Desuperheater holds reduced steam temperature constant only twenty feet downstream from desuperheater outlet, even over a 50-to-1 load range. Write for Bulletin 1037.

Copes-Vulcan Division
BLAW-KNOX COMPANY
Erie 4, Pennsylvania

BK-4410

FROM TOP TO BOTTOM, INSIDE AND OUT CENTRAL TRANSFORMERS ARE BUILT FOR SERVICE

Every step of the way!



Every Design Feature, Every Engineering Detail Of Central Transformers Have One Objective... A Product That Will Give Better Service, Longer!

Take, for instance, the method used by Central to secure the transformer cover. Common sense dictates that *multiple* clamps will permit a tighter, more evenly distributed pressure on the gasket. This method, obviously, assures a more positive seal against air and moisture. But, the real PLUS feature here is the use of hot-dipped galvanized steel clamps held in place by special corrosion-resistant brass alloy bolts. Even after years of exposure to the elements, these corrosion-resistant bolts permit easy removal of the cover for tap changing or other maintenance operations. It's the small but important details such as this that set Central Transformers in a quality class by themselves.

We Design and Manufacture Quality Transformers —Nothing Else!

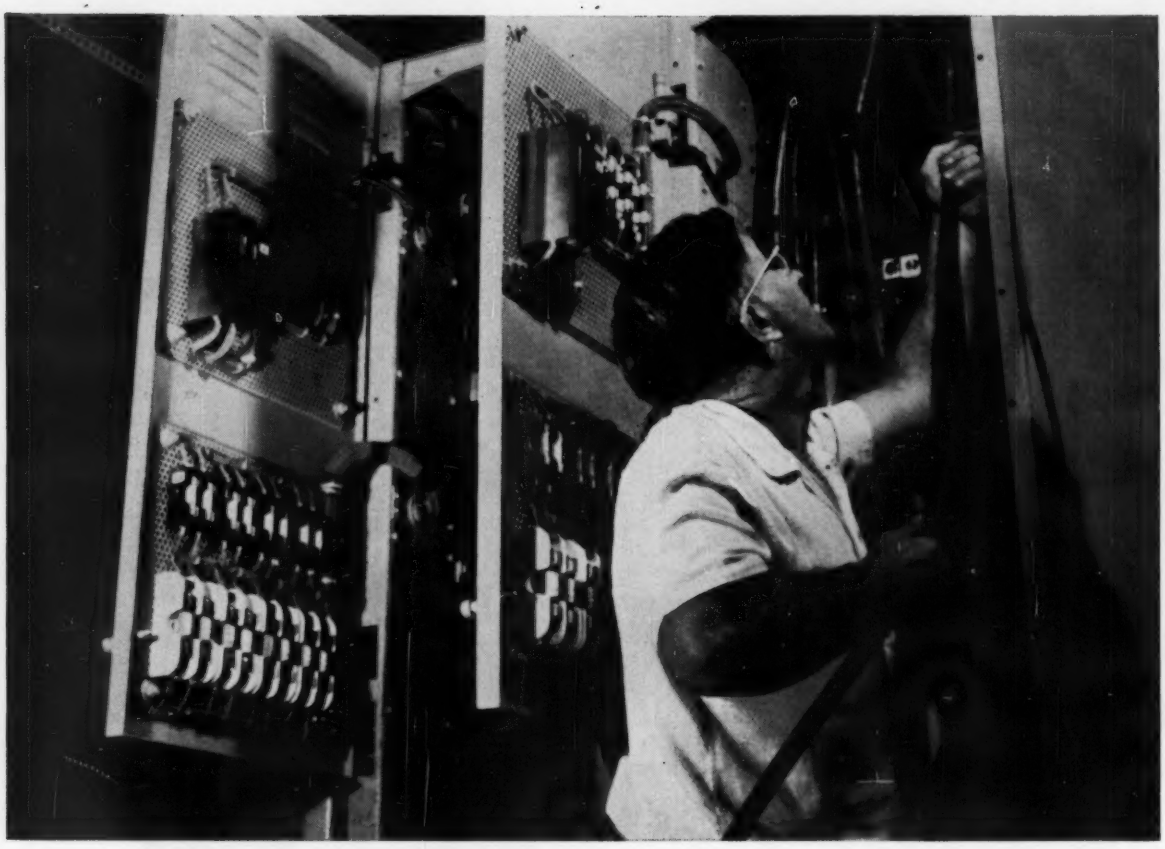
Just one more reason why Central Transformers are **PREFERRED** *throughout the Nation*

Central
TRANSFORMER CORPORATION

PINE BLUFF, ARKANSAS
Telephone JEfferson 4-5332

NEMA

Sales Offices in Principal Cities



When you must pack a lot into a small space . . . specify Rome's "CT-2" control cable

These cables are intended for installation in underground conduits or ducts, directly in the earth, or open air.

Conductors: Conductors conform to ASTM Specification B-8.

Insulation: Insulation conforms to IPCEA Appendix P.

Color Coding: All conductors shall be color-coded in accordance with IPCEA recommendations.

Assembly: For three conductors or more, the insulated color-coded conductor shall be twisted with jute fillers when necessary to make round, and a suitable tape shall be applied over the assembled core. Two-conductor cable shall be flat.

Over-all Sheath: An over-all sheath of Rome Synthinol* shall be applied over the tape core.

Here's a way to speed up the job of making complex control-panel connections in tight quarters. Install cable that meets your *budget, quality,* and *space* requirements.

You'll find that just such a cable is Rome's "CT-2" control cable. Its smaller diameter will fit into your most compact panel arrangements. It's lightweight, too, and easy to pull through conduit. And it represents good quality at moderate cost.

Your choice of cable sizes

This low-surface-friction cable has an all-thermoplastic construction featuring 3/64" Rolene insulation (polyethylene) plus an over-all sheath of Rome Synthinol (polyvinyl chloride).* It's available as a standard construction with one to 12 conductors in No. 9 and No. 12 AWG sizes.

Insulation: Sure and dependable terminations are possible because Rolene strips cleanly. This smooth, positive-stripping polyethylene lets you consistently make an efficient installation.

Sheath: Rome Synthinol is a thermoplastic (PVC) compound that offers high resistance to oils, most acids, alkalis, grease, gasoline, weathering and flame.

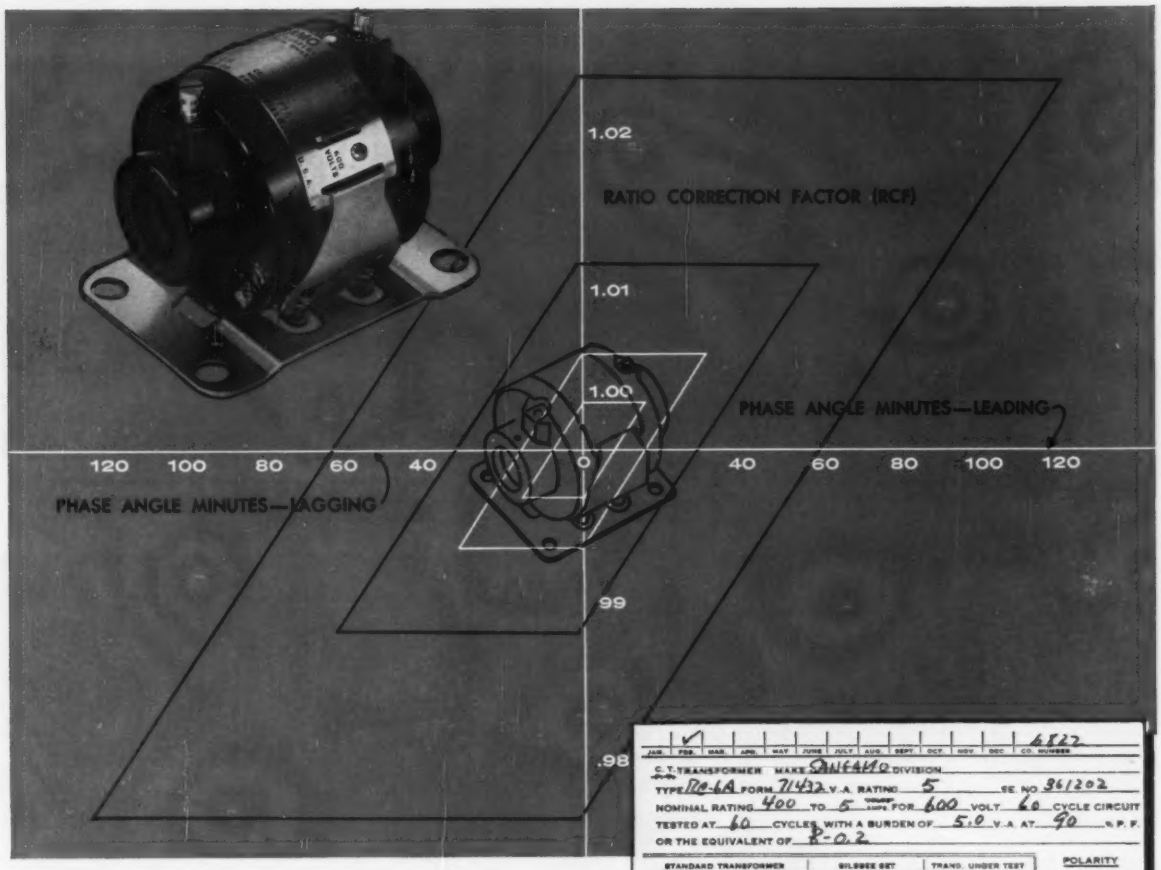
Use Rome's "CT-2" control cable for your next job where space is at a premium and fast, efficient installation is mandatory.

Find out how Rome's control cable can fit your installation picture. Contact your nearest Rome Cable representative—or write to Department 852, Rome Cable Corporation, Rome, N. Y.

*Alternate sheaths of Rolene (polyethylene) or Roseal (flame-resistant polyethylene) are also available.

ROME CABLE

CORPORATION



SANGAMO Type R TRANSFORMERS

"tailor-made" to fall within 0.3 accuracy class

You don't have to worry about accuracy when you specify Sangamo Type R Current Transformers. These transformers are designed to consistently meet the 0.3 A.S.A. Standard Accuracy Classification for B—0.1 and B—0.2 burdens.

Type R Transformers are light enough to be supported by the primary conductor alone. They are encased in a high impact phenolic shell, filled with a thermo-setting plastic that eliminates voids and seals moisture out of the core or windings.

These transformers, in the eight variations sketched below, give your engineers unusual freedom in devising simple, cost-cutting installations to meet growing needs.

Ask your Sangamo Representative or write us for Bulletin 501 for detailed information as to how these economical transformers can provide flexibility on your system.

C.T. TRANSFORMER MAKE SANGAMO DIVISION
TYPE R6-6A FORM 71432 V.A. RATING 5 SE. NO. 961202
NOMINAL RATING 400 TO 5 FOR 600 VOLT 60 CYCLE CIRCUIT
TESTED AT 60 CYCLES WITH A BURDEN OF 5.0 V.A. AT 90 % P.F.
OR THE EQUIVALENT OF B-0.2

STANDARD TRANSFORMER			BILDBEE SET		TRANS. UNDER TEST	
SEC. AMPS. OR VOLTS	RATIO %	PHASE ANGLE*	RATIO %	PHASE ANGLE*	RATIO %	PHASE ANGLE*
A	B	C	D	E	Index 01 C	
5	100.10	+2	99.98	+1	100.08	+3

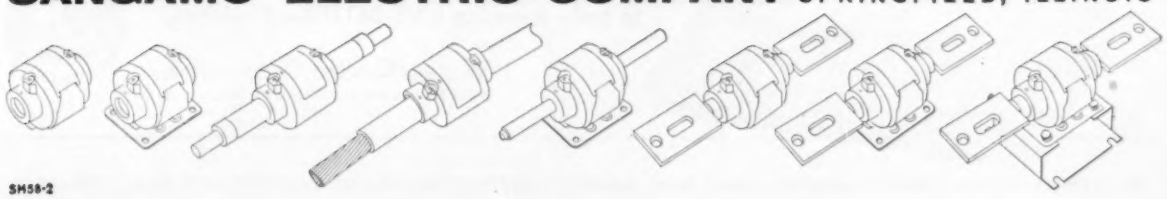
POLARITY: SUBTRACTIVE
INSULATION TEST: PRIM. TO SEC. 4000 VOLTS; SEC. TO GROUND 2500 VOLTS; 1 MIN.

*IN MINUTES. POSITIVE IF LEADING, NEGATIVE IF LAGGING. STD. TRANS. NO. 26
DATE TESTED 2/25/58 BY WP APPROVED JB

TYPICAL TEST CARD—SANGAMO TYPE R TRANSFORMER

The test card above shows why Type R Transformers pass utility company acceptance tests with flying colors. Type R Transformers hit the bull's-eye for accuracy every time.

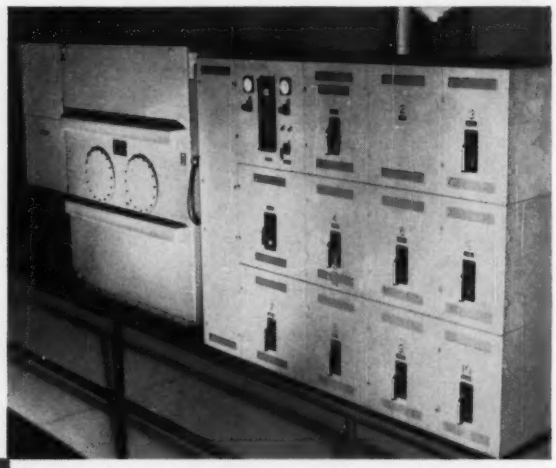
SANGAMO ELECTRIC COMPANY SPRINGFIELD, ILLINOIS



SM58-2

Schlitz

adds power capacity ...modernizes distribution system with WAGNER TRANSFORMERS



This is one of the Wagner-equipped unit substations that modernize power distribution at Schlitz. The Wagner Sealed Dry-Type Transformer is rated 1000 kva.

Jos. Schlitz Brewing Company, Milwaukee, Wisconsin.

A continuing program of modernization is one of many reasons why the Jos. Schlitz Brewing Company is a leader in industry. Plant power distribution, for example, has been modernized and expanded to assure an uninterrupted flow of electric power for production of "The Beer That Made Milwaukee Famous."

Schlitz chose Wagner Sealed Dry-Type Transformers for their power distribution load centers. These modern unit substation transformers can be safely installed in any load center—any place—because they are hermetically sealed in welded steel cases to provide positive protection from contamination, fire and explosion hazards. The only maintenance they require is a periodic checking of gas pressure (inert nitrogen), case and bushings.

Wagner Sealed Dry-Type Transformers can serve your power needs just as they do at Schlitz. They are "Predesigned"—coordinated with the specifications of unit substation builders to save job engineering, time, and money. Consult the nearest of our 32 branch offices, or write for Bulletin TU-214 for full information.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

...to help America LIVE BETTER—*Electrically*

LIVE BETTER ELECTRICALLY

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

WT58-9

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

GUY-GRIP dead-ends...

the modern twist in guying

The picture comparison makes GUY-GRIP dead-end benefits obvious:

1. THE ASSEMBLY LOOKS BETTER...
slim, modern GUY-GRIP dead-ends, free from bolts, give your guying jobs a finished, craftsmanlike appearance.

2. YOU SAVE *HOURS* OF COSTLY TIME...
takes only a minute to install a GUY-GRIP dead-end — about the same time spent in securing one nut and bolt.

3. YOU ELIMINATE ALL TOOLS...
wrenches, pliers, and other tools are completely unnecessary in applying GUY-GRIP dead-ends. The operation is done entirely by hand.

4. ASSURES POSITIVE GRIP...
under all field conditions, whether the guy is relaxed or under tension. Once the legs of the GUY-GRIP dead-end are entirely applied to the strand, you *know* the assembly is complete and permanent.

5. RESISTS STRAINS AND WEATHER...
GUY-GRIP dead-ends can take an unbelievable beating. Tension, impact, temperature extremes . . . whatever force is exerted against GUY-GRIP dead-ends, they withstand the most extreme conditions, never relinquishing a single ounce of their gripping power.

These are only a few of the many reasons why you might want to try the modern twist in guying. Write for more information: Preformed Line Products Company, 5349 St. Clair Avenue, Cleveland 3, Ohio. Cable Address: Preformed-Cleveland.

PLP 10 YEARS OF Power Line Progress

You can look up to

Preformed

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.

EACH LINE MATERIAL TRANSFORMER is issued an IBM card upon which are placed all test results and reference information pertinent to the unit. Cards are microfilmed as a permanent record.

How L-M's Quality-Control System Insures High Transformer Standards

By **ROBERT P. THOMPSON**
Manager of Engineering
Transformers
Line Material Industries

Performance characteristics of L-M Round-Wound® transformers are outstanding. Physical features are exceptional. Quality is *built in* to L-M transformers, not tested in. To make doubly sure of maintaining uniformly high quality, L-M has established a very tight quality-control system.

Continuous tests are made—from raw materials to finished product. A final assurance of quality is the permanent microfilmed record of test information kept on every L-M transformer.

CORE TESTING: The tolerance permitted in testing the bare core of L-M's Round-Wound transformer is much more stringent than required by NEMA and ASA of core performance in the completed transformer.

The specially trained craftsmen who make Round-Wound transformers take pride in the high quality of their work—no small contribution to the continued excellence of Round-Wound transformers and their amazingly low failure rate—less than 2/10 of 1 percent!

Check on Incoming Materials

All raw materials and parts for L-M Round-Wound transformers are rigidly and systematically inspected. For example:

- Every high-voltage porcelain bushing is subjected to acceptance dielectric tests.
- Samples of all wire are tested for resistance and cross-section uniformity; coating is tested for dielectric strength, adherence, thickness.
- The cold-rolled oriented silicon steel used in making L-M's wound core is tested for physical and magnetic characteristics by means of a precision Epstein tester. Rigid standards on the loss and permeability characteristics are maintained.

In-Process Tests

A continuous "in-process" testing and inspection program is followed throughout the plant. Cores are tested for magnetic characteristics before and after copper coils are wound upon them. Coils are checked for ratio and given a mechanical inspection immediately after being wound. All finished units are thoroughly tested for leaks.

COIL RATIO TEST: Ratio and polarity are checked immediately after the coil is wound, so as to maintain close surveillance of the coil-winding operation at all times.

When the unit is completed, every transformer is given a complete series of electrical tests in strict conformity with NEMA and ASA standards. These tests include core loss and excitation current, copper loss and impedance, ratio, induced voltage, high potential, polarity, and impulse.

Certificate of Test

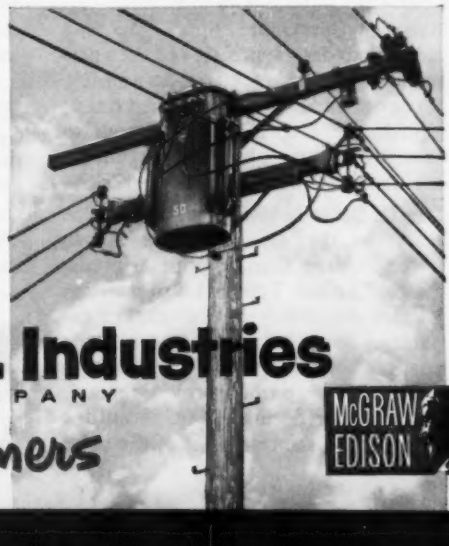
Each transformer is issued an IBM card which follows the unit through to completion. The card provides space for all test results. It is punched or filled in at each inspection and test station if, *and only if*, the transformer satisfactorily meets all the requirements of NEMA standards and of the L-M engineering and quality-control departments.

When the transformer is shipped, the cards are microfilmed and then stored to provide actual test data throughout the life of the transformer. This complete test information can be furnished to you at any time on any transformer.

Compare L-M's high standards of performance and outstanding physical features with other transformers; you will see why more customers are specifying L-M Round-Wound transformers.

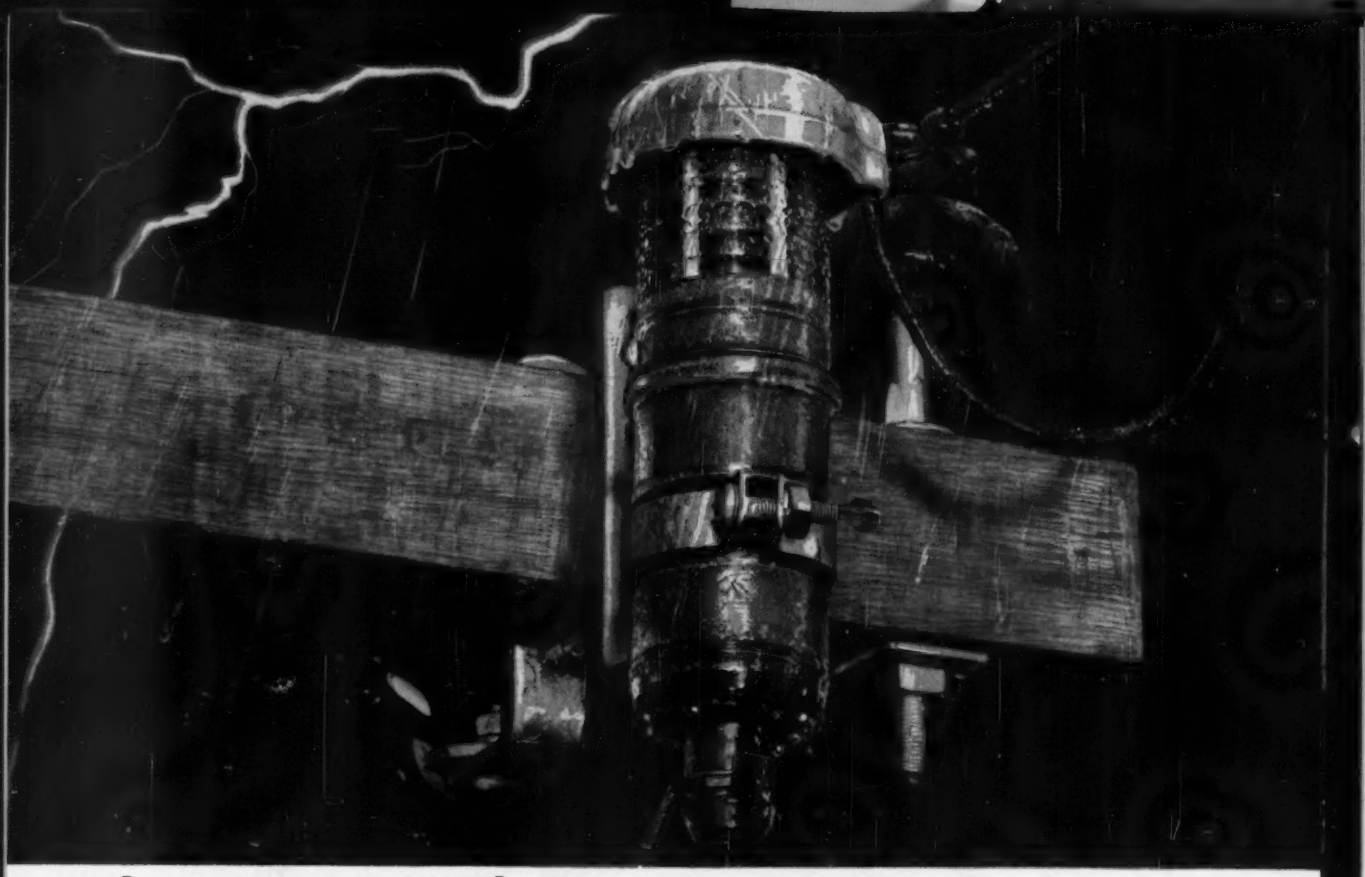
Get Complete Information

Ask your L-M Field Engineer for complete information on the outstanding performance characteristics of L-M Round-Wound transformers and on L-M's unique obround tank. Or write Line Material Industries, Milwaukee 1, Wisconsin.



LM® **LINE MATERIAL Industries**
McGRAW-EDISON COMPANY
Transformers

McGRAW EDISON



Why More Utilities Are Selecting L-M Type E Valve Arresters

L-M valve-type distribution lightning arresters have established an outstanding performance record by giving millions of service years of reliable protection. The Type E has been a leader in the field, and hundreds of thousands have been giving excellent service for many years. The failure rate is phenomenally low.

Here are some of the reasons for this remarkable record, and for the great increase in customer preference for the L-M Type E valve arrester.

Balanced Sparkover: Spark gap is a ladder-gap design, pre-set and then permanently sealed in the arrester housing. It cannot be knocked or burned out of adjustment. Gap is precision-made to assure optimum balance between 60-cycle sparkover and impulse sparkover.

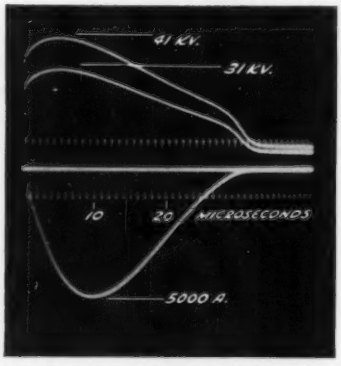
Low IR Drop: L-M now has a new Type E arrester, the E-3, which provides even lower IR drop than its popular predecessor. The new Type E-3 also provides greater durability and discharge capacity. These advantages are made possible because the new Type E-3 has an improved gap which provides greater 60-cycle interrupting ability, permitting reduction of the resistance of the valve element. The oscillogram shows the improvement in IR drop between the Type E and the new Type E-3.

Positive Protection: L-M valve arresters have a Pyrex glass housing which permits visual inspection of the spark gap in the field. Should the arrester become damaged, telltale evidence can be readily seen through the glass. If the arrester should fail to interrupt 60-cycle follow current for any reason whatsoever, L-M's patented Isolator provides positive assurance against grounding the feeder by disconnecting the ground lead from the arrester.

Other features include Zincilated (Zincilate No. 100) arrester housing clamp, fibre-glass cap, and fibre-form packaging. New packaging provides additional strength to the carton so arresters can be stacked easily on pallets.

Get Complete Information

Get the whole story of L-M arrester performance and application. Ask the L-M Field Engineer, or write for a copy of bulletin on the new Type E-3 arrester, to Line Material Industries, Milwaukee 1, Wisconsin.



Oscillogram shows reduction in discharge voltage in the new Type E-3 valve-type lightning arrester. Curves are for a 9 kv unit. IR drop has been reduced from 41 kv to 31 kv—a remarkable improvement in a unit that already has established an enviable performance record over many years' service.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY

Lightning Arresters

McGRAW EDISON

MARCH 17, 1958

Dimensional Standards for Bushings – An Accomplishment

The American Standards Association will this month publish dimensional standards for apparatus bushings for use on outdoor circuit breakers and power transformers above 69 kv—ASA C 76.1a-1958. This action brings to a workable conclusion efforts to solve one of the industry's oldest and most vexing problems; dimensional interchangeability of apparatus bushings.

All credit and appreciation is due to men of ASA Committee C 76 who worked on this project. The ultimate success of their efforts testifies to their persistence and capacity to reconcile many divergent views and interests. But perhaps more significantly it demonstrates the urgency of the industry's need for bushing standardization.

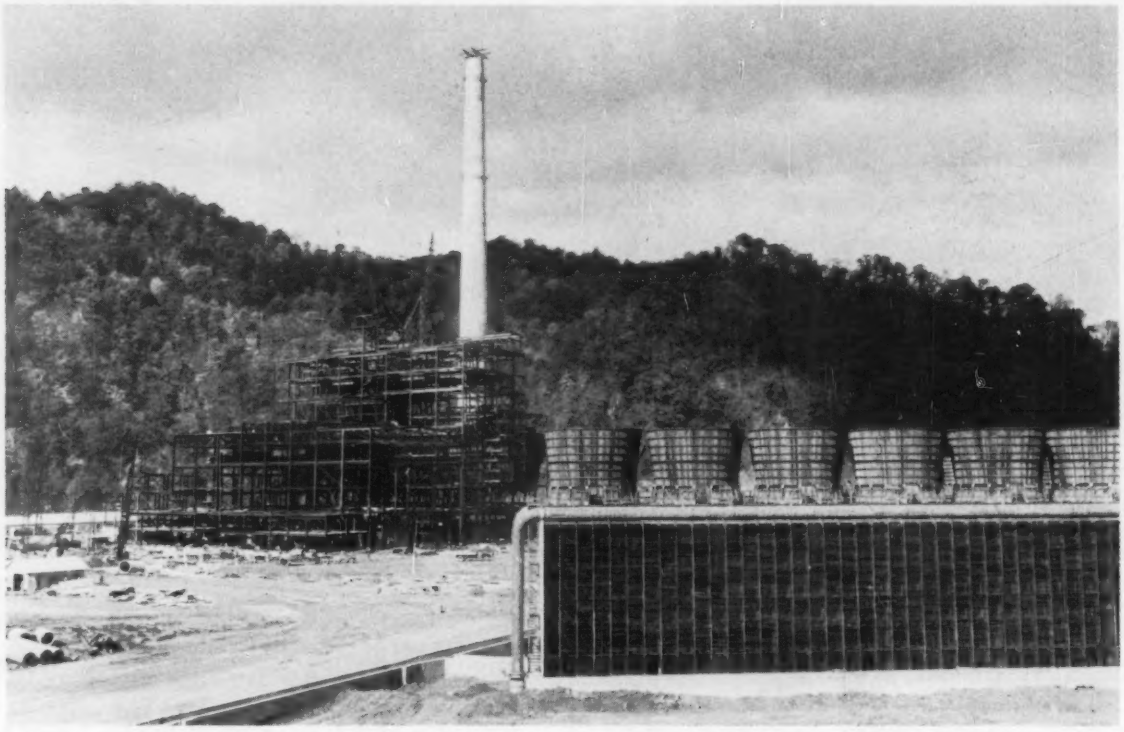
For many years considered irreconcilable, the need for interchangeability of apparatus bushings was first felt in the 1920's. At that time producers had evolved a series of bushing vintages, all with different dimensions. Spare parts inventories and the cost of repair facilities became a major problem. Urged on by large-system operators, of that time, AIEE committees attempted such standardization. The results were limited to standardization in the broadest terms, such as creepage distances and flashover values.

Renewed efforts in the late 1930's to work out interchangeability, this time through the ASA C 76 Committee, were delayed by World War II. But the problem was attacked again with the coming of peace.

Today's new standard is the culmination of these efforts. Although it appears deceptively simple, the number and complexity of the operating and design problems were so great that at one point the participating manufacturing group felt design problems alone were impractical of solution. But operating problems and recognition of maintenance costs had become so great that system operators insisted on further efforts to standardize. Largely as a result of their insistence, manufacturers were able to reconcile their differences and agree on dimensions which appeared both practicable and usable.

As soon as agreement seemed assured and proposed dimensions acceptable to all groups, manufacturers in general adopted them. As a result bushings and equipment meeting the new standard have been available on most major equipment for some time. Design and tooling problems have been solved to the point where users can secure standard bushings and apparatus today from their normal sources of supply. By means of simple adapters these standard bushings can also be fitted to older equipment.

But availability of interchangeable bushings does not make a standard successful. No standard is any better than the acceptance and usage that it receives. It will take positive support on the part of the manufacturers and the user if full benefits of the standards are to be realized. The dedicated men who worked to build this standard have done their part. It now remains for the utilities and apparatus manufacturers to give these efforts the endorsement of full and complete acceptance and use.



TYPICAL of utilities '58 spending plans is $55-million, Clinch River Plant of Applachian Electric Power. Each of four new cooling towers is 260 ft long, 60 ft wide, 60 ft high. They'll condense 220,000 gpm for two 225-Mw units

Utilities' Spending Plans Lead Industry

Study by Securities & Exchange Commission and Commerce Department reveals 4% gain over '57 is expected for utilities

The utility industry's growth will be at a slower pace than last year.

Some $6,414,000,000 of new plant will be built this year, if utilities carry through their plans. Compare that with $6,195,000,000 of expansion in 1957—and you have a 4% rise. That is not as dramtic as the rise between 1956 and 1957. Public utilities investment in new capacity then rose from $4.9 to $6.2 billion.

But in the new government figures just published, the utilities are a bellwether of growth. The statistics include natural gas, but for purposes of judging electric industry planning, you can take the comparisons as evidence of what is going on in the steam and hydro fields.

The new figures on capital expansion come from the report of the Securities & Exchange Commission and Commerce Department. Figures cover intentions to build new plant and buy new equipment in 1958, and compares intentions with what happened last year.

The figures are crucial to government officials attempting to assess the business outlook. With unemployment rising—to a total of 5.2 million in February—capital spending becomes even more significant. The figures will help to set Administration policy on public works and tax reductions.

The figures are gloomy for industry as a whole. In 1958, all of business plans to spend only $32.1 billion for new capacity, as against $37 billion in 1957—a record year. The downtrend is in almost every industry, including the manufacturing industries that electric utilities serve, and from whom utilities buy their equipment.

Here is what the Commerce Dept-SEC report estimates for the first half of 1958 for utilities with 1957 comparisons (in billions) by quarters:

	1st	2nd	3rd	4th
'57	$1.2	$1.5	$1.7	$1.8
'58	1.5	1.7	——	——

Seasonally adjusted, the estimates indicate first two quarters of 1958 are sufficiently strong to give the entire year a higher total—$6.4 billion over 1957's $6.2 billion.

While utilities intentions are up that 4%, manufacturing generally is down 17%.

If you separate durable manufacturing from non-durable (hard goods and soft goods) these are the figures: durables down 22% from last year, non-durables, 12%.

The government report is based on a survey of business plans as anticipated in the Jan. 1 to early March period. The survey complements, though is not strictly comparable with the McGraw-Hill Economics Dept capital spending survey.

Last November, the McGraw-Hill survey estimated that electric and gas utilities would spend $6,441,000,000 in 1958, as against the then estimate of $6,254,000,000 last year. The McGraw-Hill increase, thus, was 3%, the SEC-Commerce, 4%. The latest McGraw-Hill survey on capital spending of industry is now being made and is scheduled to appear in Electrical World's April 21 issue. The survey will cover the year's 1959-61 inclusive.

The electrical equipment manufacturers intend to continue to cut back expansion this year.

The industry zoomed from a $436-million capital building drive in 1955 to $603 million in 1956. But last year, plant and equipment spending went down to $599 million, and SEC-Commerce estimates it will continue to go down to $563 million in 1958.

Change Set on Relocation Cost

The Eisenhower Administration is expected to unveil soon its proposal for amending the Highway Act of 1956 to prohibit the federal government from helping reimburse utility companies which must relocate facilities on publicly owned rights-of-way.

Thus far, however, Democrats are showing little interest in the Republican attack on the reimbursement principle.

Under the act, which launched the big interstate road building program, the federal government treats utility relocation costs the same as other costs. Hence, in those states where utilities are compensated for relocation, the U. S. reimburses the states in the same proportion that the federal government contributes to total construction costs. This is 90% in the case of the interstate system, and 50% for others.

Since passage of the Highway Act, 16 states passed laws under which the states partially or wholly compensate utilities for costs of relocation due to highway program.

Secretary of Commerce Sinclair Weeks told Congress in January that funds badly needed for new highway shouldn't be diverted for payment of relocation costs, and that the law should be amended accordingly.

Sen. Francis Case (R-S.D.) thereupon introduced a bill under which the Federal contribution toward relocation costs would be limited to 50%.

However, Federal Highway Administrator B. D. Tallamy made it clear recently that the Administration is against any reimbursement where utility facilities are located on non-utility property.

Tallamy told the Senate roads subcommittee, now holding hearings on various problems in the highway program, that the Case bill would "unquestionably be a deterrent to the enactment of legislation" by the states to reimburse utilities.

"We believe that when property is taken for the right-of-way of a federal-aid highway," he explained, "federal funds should participate in the cost thereof to the same extent, whether the owner of the property is a private individual, a utility or some other entity."

However, he re-emphasized the Administration's stand that federal funds should not be used for payment of relocation costs where utilities are occupying public rights-of-way as a convenience to themselves, and have no vested property interest in the rights-of-way.

Tallamy said draft legislation is being prepared, and will be submitted to Congress soon.

'Service as Usual' in 2 Strikes

The work of supervisory personnel is keeping operations at near normal conditions at the strike-bound Consumers Power Co and the Kyger Creek Plant of Ohio Valley Electric Corp.

Main issue at Consumers, said one company spokesman, is "Who is to run the company?" The Utility Workers Union of America has made 64 demands, but discussion has centered on a proposal that would bind the company to make no changes in methods of operation without union consent.

Consumers position is that the right to make changes is the prerogative of management. The UWUA also seeks a 25¢ an hour wage increase compared with the company's offer of 7¢ an hour effective March 1, 1958, and another 7¢ on March 1, 1959.

The strike began March 5 when negotiations bogged down. State and federal mediators were on hand but were unable to arrange a compromise. Picketing is quiet. Some activities, such as appliance repair, have been suspended by the utility.

The Kyger Creek deadlock appeared no closer to solution at Electrical World press time. The UWUA and OVEC officials last met on March 5. No meetings are scheduled for the future.

Strikers are picketing at two plant gates. To date, the union's threat of picketing plants of the 15 power companies that jointly own OVEC has not materialized. Kyger Creek's 1,075-Mw capacity supplies just under one-half the power requirements of the Atomic Energy Commission's plant at Portsmouth. No curtailment of power has occurred.

About 80 supervisory employees are operating the steam station.

New Landmark on Lake Erie Takes Its Final Form

A 38-ft high, 100-ton reactor vessel has become a new landmark for residents at Lagoona Beach near Monroe, Mich. The stainless steel container, one of the major components of Power Reactor Development Co's Enrico Fermi Atomic Plant, is now receiving its finishing touches. Construction on the 150-Mw breeder reactor plant is on schedule, the company says, despite the big February freeze in the Lake Erie region. The plant will cost an estimated $75.3 million when completed late in 1959. PRDC ic comprised of 21 industrial firms, over half of which are utilities.

Competitive A-Power Seen

Edison Electric Institute's task force on nuclear power, making the prediction, bases it on technical consideration only

Competitive nuclear power in some parts of the U. S. in the next ten years is the conclusion of the recently released report of the Edison Electric Institute's Technical Appraisal Task Force on Nuclear Power. The Task Force did not venture to say where, exactly when, how, and with what type reactor this would be accomplished. In fact, the electric utility experts were emphatic in their belief that the successful reactor type could not be predicted now. But they were specific in recommending certain approaches to the problem. Basing their recommendations solely on technical considerations, they suggested:

1. General research and development in the relevant fields of science and nuclear power technology be assigned the highest priority.

2. A very broad construction program is necessary. Experimental, prototype, and full-scale power reactors should all be constructed.

Further development of high-temperature fuel materials was high on the list of specific research items which ought to be examined or expanded. Development of fuel materials suitable for very high burnup, corrosion studies of materials used in nuclear reactors, and programming of shifting fuel in a reactor were other areas the Task Force thought deserved attention.

Full-scale nuclear units should have a generating capacity of 100 Mw or more according to the Task Force. The report did not specify a size requirement for prototype reactors because the size would be somewhat dependent upon the type.

Under recommendations for reactor experiments the report suggested:

1. Liquid metal-fueled and fused salt-fuel reactors.

2. Intermediate energy reactor.

3. Sodium-cooled, heavy water moderated reactor.

4. Steam-cooled reactor.

The Task Force went over much the same ground as previous investigators as far as costs are concerned. And it came to the same general conclusions. There just isn't enough concrete information or experience available to provide reliable cost information.

Fabrication Cost Best Area

No one factor is responsible for the present high cost of nuclear power. In order to obtain competitive costs, reduction in the capital costs, fuel costs, and operating and maintenance costs are required. The Task Force suggested that the cost of fabrication for enriched reactors offers the best area for potential improvement because it is one of the largest components of nuclear fuel costs.

Because of these uncertainities the experts felt it is impossible to single out any reactor type or types that should be emphasized. Most of the principal reactor types in some respect show promise of improvement, and therefore, it is possible that several may, in time, reach the

economic goal of producing power at costs competitive to fossil fuels.

Further difficulties in the area of cost prediction are complicated by the fact that the price of enriched uranium and heavy water are established by the federal government. They are not commercial prices. The same statement applies to the buy-back price of plutonium and uranium-233.

This is the first report of the eleven-man Task Force established by EEI in Sept. 1956. Utility members of the Task Force include: J. F. Fairman, Consolidated Edison Co, chairman; J. B. Black, Pacific Gas & Electric Co; Walker L. Cisler, Detroit Edison Co; H. J. Scholz, formerly with Southern Services Inc; Philip Sporn, American Gas & Electric Co; William Webster, New England Electric System.

Nuclear Notes

Federal budget for fiscal '59 calls for $2,550 million on atomic energy, up $250 million over last year. It includes $97.7 million for civilian power reactors—$7 million above last year—and $26.6 million on "civilian power supporting effort."

Evaluation Center of Westinghouse Electric Corp hit critical stage with first test of core being developed for Yankee Atomic Electric Co's 134-Mw plant.

Estimated $4-billion sales of equipment and components for U. S. and foreign reactors can be expected by U. S. manufacturers in next ten years, based on recent Atomic Industrial Forum survey.

Natural uranium reactor design by Canadian Westinghouse contains fuel in horizontal pressure tubes (HPTR). Contained high-temperature coolant keeps surrounding heavy water moderator at low temperature. Power cost for 132-Mw HPTR plant would be about 8 to 12 mills/kwhr in Canada.

Corps Tells What Happened to Chief Joseph Transformers

Newspaper stories and short magazine articles have indicated there has been trouble with transformers made by English Electric Company, Ltd., of Stafford, England, purchased by the Corps of Engineers for use on the Chief Joseph project on the Columbia River in the state of Washington. The following article has been prepared by the Corps, "with the hope of eliminating any misunderstanding about what actually happened at Chief Joseph Dam."

The Seattle District, Corps of Engineers, U. S. Army, awarded a contract to the English Electric Export and Trading Co, Ltd, on their low bid for the design, manufacture, test and delivery of ten transformers for the Chief Joseph project. These transformers were rated at 103,000 kva each, single phase, FOW, with two separate 13.2 kv, l-v windings and a 230 kv wye connected h-v winding insulated for the 900 kv BIL.

Although two failures have occurred, there has been no loss of power production as the English Electric Co has been cooperative and helpful.

The standard Corps specification was used for the purchase of these units. The specification does not stipulate the type of winding desired. Company designers use the type of construction normally used as their standard product. A standard set of tests are specified, which are designed to demonstrate that the characteristics specified have been obtained. These tests include the NEMA Steep Front of Wave.

Design Changes Stipulated

Transformers offered by English Electric were of its standard design for size and voltage classification and included an oil conservator. Before awarding the contract, the Corps stipulated that conservator vessels be eliminated and the design modified to be a conventional gas seal design. This design is based on a core form transformer with a helically-wound, l-v coil, separated from a h-v coil by a cylinder, using English Electric's interleaved construction, to distribute steep front voltage waves over the whole winding placing even stress on all parts of the insulation structure.

This type of winding is recognized as being well designed for distribution of the h-v stresses, but has not yet been used by U. S. manufacturers for higher voltage transformers. Included in insulation between the two windings is an electro-static shield of metal grounded to the core. This shield protects the l-v coil from damage when steep front waves are impressed on the h-v winding. It is made up of thin strips of metal, electrically connected to each other and to ground on one end, completely encircling the l-v coil. But the two shield ends are insulated from each other to avoid a short circuited turn around the core. This shield is placed relatively near the l-v coil, leaving the major thickness of insulation between the h-v coils and ground.

First Tests Easily Passed

All transformers passed their factory-conducted tests easily and were accepted. They were delivered and put in service with only the usual checking for shipment damage.

The first bank was placed in service Aug. 14, 1955. It was soon apparent the top oil temperature thermometers were more affected by outside air ambient temperatures than by loads on the transformer. This was caused by a body of uncirculated oil at the top of the transformer.

Circulating pipes for the oil cooler system are arranged to supply cooled oil to the bottom of the transformer and to take hot oil from the top of the tank. The shape of the transformer cover and location of the cover flange limits the space available for this top oil connection. As originally constructed it was located below the flange. This effectively traps a quantity of oil at the top of the transformer that is never circulated. The top yoke of the core

iron extends up into this body of oil and all losses in this section of the iron increase the oil temperature until a heat balance is established by radiation of this heat from the transformer tank to the surrounding air. The hot spot temperature detecting devices were located in this oil and gave a false indication of the winding temperature. On hot summer days this temperature exceeded normal operating temperature limits and load on the units had to be reduced.

The oil piping has since been modified to circulate all the oil and the temperature detecting devices are consequently giving a better picture of the actual winding temperatures.

Insulation Breakdown Described

On May 29, 1956 one of the transformers in the first bank failed by a breakdown of insulation between the h-v winding and the shield, which in this case represents ground. The connection between the shield and the core also failed in a manner that involved the l-v winding. These transformers have electrically separate l-v windings, one on each leg of the core. Generators are connected to each of these windings.

Second Fault Hindered Study

When the fault occurred, high voltages on the l-v winding damaged the generator protective equipment leaving the operator with indications of trouble in both the generator and transformer. In locating the trouble, he connected the generator still in good order to the l-v coil not involved in the first fault and raised voltage to the point where a second fault occurred. Since this build-up of voltage was made with short circuited turns existing around the core, the damage to shields and coils was extensive and so involved it was virtually impossible to establish definitely the reason for the first failure.

This transformer was shipped to English Electric's subsidiary plant in St. Catherines, Ontario, for repair. New coils were made in the Stafford, England factory, shipped to St. Catherines in sealed shipping cans, and the transformer re-assembled there. Complete tests were made, except for load tests, and the transformer returned to the job.

When put back in service a second failure occurred within a few hours. This started as a turn-to-turn fault on the h-v winding and was almost certainly caused by moisture as pools of water were found when the tank was opened for inspection. It was subsequently established that one of the oil coolers connected to this transformer had a cracked tube sheet and had developed a water leak.

Examination of the unfaulted coils of the first transformer raised questions on the insulation structure between the high and l-v windings. English Electric requested authority to remove a transformer from service after about one year's use, for shipment to the Stafford plant for additional inspection, more thorough testing and possible modification. This authority was granted and the selected transformer removed Dec. 14, 1956.

Inspection of the windings on this transformer during disassembly revealed shrinkage in the insulation between the high and l-v coils. There appear to have been electrical discharges between the coil insulation and the outer layer of the many turns of fuller board making up the main insulation barrier. Many wrinkles had been formed in the insulation barrier and in some of these wrinkles there were traces of a wax deposit indicating the presence of corona and the subsequent polymerization of the oil. The surface of the copper shield near the low voltage coil was also wrinkled and contained traces of wax. Some of the copper forming the shield was discolored, showing heating had been occurring, probably caused by circulating currents generated by stray flux in certain sections of the shield.

Corps Accepts Suppliers' Plan

Based on all data collected from the various coils that had been disassembled, the supplier proposed to the Corps that all transformers be returned to the factory for modification of the coil insulation and shield. The same winding would be used but the size and type of material in the shield would be changed, better methods devised for placing the shield, and better control established for winding the paper barrier to eliminate the shrinkage. In addition, the supplier proposed to make available at its shop two extra transformers during the repair period so that the project will be able to maintain all banks in service and at the same time have a spare available. This proposal has been accepted by the Corps.

English Electric welcomed a suggestion by the Corps that the latter should work with the factory people during the time that new techniques for winding the insulation barriers were being investigated. During the period a Corps' representative was at the factory, English Electric devised new methods of installing the shield, permitting this to be inspected after placement, with a view to eliminating wrinkling of the shield. A higher resistance material is being used in the shield, and the shield has been made shorter than the original design to avoid areas of high flux unbalance around the core.

Banks of heat lamps have been installed to dry the fuller board as it is wound into the major insulation barrier. An automatic tension-

Table Rock Order Let

U. S. Corps of Engineers has just signed a contract with English Electric Export & Trading Co for another power transformer to be supplied by the English Electric Co for installation at Table Rock Dam, Mo. It is a three-phase, 13.2 stroke 161 kv unit.

The transformer will be the second ordered by the Corps from English Electric for the project. The supplier has delivered or has under contract equipment totaling about $2.5 million for Table Rock. This includes four turbines and the transformers.

ing device maintains constant winding tension. The circumference of the completed cylinder is measured in several places for control purposes. It is completely dried in a vacuum oven. Tolerances have been established to limit the amount of shrinkage that will be acceptable after the drying is completed. Several trial cylinders were made and torn apart during this stage of the development and the results indicate shrinkage has been eliminated.

Two of the original transformers have been rebuilt incorporating the changes outlined above. They have been returned to the job and are now back in service. The two extra transformers being furnished by the supplier for the rebuilding program have been completed and dispatched to the job site. A regular schedule of returning units to the factory, two at a time, has been established and will be put into action this spring. The last transformer will be returned to the job site early in 1960.

Corona Reduced on New Units

The Corps of Engineers has made tests to detect corona on the eight transformers still in service. These tests indicated all but one of the transformers had corona in varying amounts at normal operating voltages, and the oscillograph record shows suspected corona in the insulation barrier. Similar tests which were made on the two new transformers to be sent to the project by English Electric indicated negligible corona at operating voltages. Further studies of corona in transformers are being made by English Electric in their h-v research laboratory and additional tests will be made by the Corps at the project.

English Electric people have been most cooperative throughout the investigation and solution of the problems on this job. This is exemplified by the loan of the two extra transformers during the rebuilding period to eliminate any loss of power from the project and to complete the work in as short a time as possible. The procedure will permit alteration of the transformers without any interruption or delay in the production schedule originally planned.

MVEA PRESIDENT Dudley Sanford told conference that the power salesman is the 'greatest catalyst in our industrial process. GE's D. H. Lapray, left and G. A. Jennings of Kansas City P&L, chairman of I&C Sales Committee, look on

MVEA Spotlight: Electric Heat

Missouri Valley Electric Assn sees it as way to fill load valleys, and lays down factors for its successful promotion

Electric heating held the center of the stage at Missouri Valley Electric Association's annual Industrial and Commercial Sales Conference recently in Kansas City.

Here are some of the electric heating highpoints:

- Quality of the job is the major factor.
- Successful programs require the complete backing of management and a fully-manned sales staff.
- Rates are important, but not primary. Conferees pretty much agreed that people buy electric heat for its other advantages, such as comfort and convenience.
- Early work with architects, engineers and electric contractors is essential on new jobs. One suggestion in connection with this is that utilities go to the colleges and make electric heating information available to future architects and engineers.

Induction Heat Stressed

But space heating was not the only type of electric heating featured. General Electric's D. H. Lapray stressed the applicability of electric induction heating, and its advantages in industrial processes.

If heating held center stage, it did not get the spotlight all the time. The real key in any electric sales program—heating or otherwise—is the utility's Power Salesman. Association president Dudley Sanford (also vice president of Union Electric Co) lauded him as the "great Catalyst." And his most important quality, according to Sanford, is imagination — imagination which helps his customer toward lower costs, greater sales, and improved profits.

Other activities plugged at the MVEA agenda included lighting (Daybrite's J. W. Hamilton: "Consider lighting in what it means to the health and happiness of the American people . . ."); Commercial cooking (Hotpoint's W. C. Ayres: " . . . greatest opportunities lie in the new construction fields . . ."); and "face-to-face" selling.

Missouri Edison Co's S. L. Paul was elected chairman on MVEA's Industrial and Commercial Sales Committee. Vice chairman is H. E. Ryerson of Iowa-Illinois Gas & Electric Co.

State Initial Results With Deionizers

Two users tell EEI T&D group. Studies pointing to 240 v as ultimate for appliance design and a better way to evaluate service reliability are revealed at Baltimore meeting. Work simplification program discussed.

Further experience with Cougnard deionizers as a means of complete lightning protection for overhead lines is needed before firm conclusions may be drawn. "Inconclusive" reports covering three years of service were presented before the Transmission and Distribution Committee of Edison Electric Institute, at Baltimore, Md., Feb. 10-12.

Operations during four lightning seasons before and during two seasons after the deionizers were installed on a 33-kv line (EW March 11, 1957, p 85-87) were compared by H. N. Ekvall, Philadelphia Electric Co:

1. Average number of line trippings was reduced moderately (32%), when related to lightning severity. The reduction was 63% when certain factors were discounted. Average number of locations with wire burndowns, line insulator damage, and splintered poles also was reduced, based on relative lightning severity.

2. Average rate of primary line and transformer fuse blowings (per 100 fuses) on underbuilt 4-kv lines was reduced 85% (from 5.9 to 1) compared with an increase (from 2.3 to 2.7) on 4-kv lines not under the 33-kv line with deionizers.

3. Major reduction in teletype interference was noted at a nearby military installation following use of deionizers.

Perform as Discharge Gaps

Ekvall pointed out that deadend-type deionizers seem to perform more frequently as discharge gaps for lightning surges than as barriers of ball lightning. They have discharged mostly without accompanying line trippings, indicating a possible and unclaimed arc-interrupting ability. Their widespread discharge activity is due mainly to a low-impulse sparkover strength, only 200 kv as contrasted with 700 kv for the 33-kv line in general. Ekvall concluded that additional experience, supplemented by 60-cps impulse laboratory tests, is needed.

Less encouraging was a report on one year's experience with deionizers on a 34.5-kv line. C. J. Zeller, Baltimore Gas & Electric Co, said the greatest increase (130%) in faults during 1957 over the five-year average occurred on the feeder with deionizers. Of seven other feeders which have had poor lightning records, only two were worse than the average (115% and 123%). The line with deionizers, said Zeller, made the poorest showing among five feeders serving the northwest quadrant of Baltimore G&E's area.

This line is a 40-mile, 34.5-kv, 3-phase feeder with solidly grounded neutral. By March, 1957, 111 deadend-type and nine pin-type deionizers, plus "roundouts" at angles greater than 30 deg, were installed and approved by the manufacturer. The line has a substation oil breaker and two-shot fuses at about the mid-point. Valve arresters were left on the line. Cost of the installation was about $1,000 per circuit-mile.

Faults on the line, Zeller explained, refer to a station breaker opening on quick-trip and reclosing, with the feeder staying in. Deionizer inspection showed many more flashovers than can be supported by feeder breaker operations. Concurring with Ekvall, he said many burn marks were found on deionizer plates. Deadend plate spacings will be increased from 9½ to about 13 in. following the manufacturer's suggestion, on about half of the line, to compare the effect of this modification on future performance.

Conclusions Given

Studies of higher secondary voltage systems for residential service prompted the following conclusions, said A. S. Anderson, Ebasco Services, Inc:

1. Service voltage-to-ground on which all appliance design ultimately should be based is 240 v. Dual ratings will permit interchangeability between 120 and 240-v appliances.

2. Elimination of secondary systems with nominal voltage less than 120 should allow for a shift in design voltage from 110-125 to 114-130 v. Double voltage-to-ground would be 228-260 v. Delta secondary systems operating at the lower end of the range would provide 228/456 to 250/500 v. Wye systems operating at the upper end would provide 236/408 v to 258/466 v.

3. As an alternate, do not shift the design range but use 416-v motors on wye systems. This would permit use of motors designed for 380-v systems and give manufacturers a better competitive situation.

4. The 265/460-v, 3-phase, 4-wire system should not be extended into commercial and residential usage because it will perpetuate the need for 265 to 240-v transformations for single-phase use. Characteristics of 440-v motors and economical secondaries and "house" wiring should not require a 265/460-v level.

Two Basic Forms in Use

Evaluating service reliability and determining causes of interruptions is a simpler, less costly, and faster operation now that company-wide standards for reporting interruptions have been adopted, reported G. G. Bailey, Commonwealth Edison Co. Use of two basic forms—record of interruptions, and a form for machine-punching of data—have led to these benefits,

Are Inconclusive

based on a year's experience: Performance among divisions may be compared rapidly and accurately; monthly, quarterly, and annual trouble reports are available in ten to 15 days after the period's close; about $7,500 of engineers' time is saved annually; using punch-card equipment, one man can prepare the complete summary covering over 10,000 interruptions in 8 hr; and lastly, tabulations of interruptions may be prepared on most any basis. Studies may be made of such factors as material and equipment performance, system design, and tree trimming.

Progress was indicated by three reports on standards and specifications. Compression tools and fittings for tension sleeves can be standardized, said H. MacVaugh, Philadelphia Electric. It remains for utilities to buy the interchangeable fittings. He reported that hand-made fittings, interchangeable among six makes of tools, worked well for a four-wire-size range representing 40% of all wire for distribution. One more size added to the range will cover 76% of wire; several more sizes will take over 90%.

Working specification for aluminum conductor fittings may be available soon, said Frank Sanford, Commonwealth Associates, reporting on EEI's project at Armour Research Institute. He enumerated these results: Initial relaxation of the fitting, a direct function of temperature, is unavoidable but does not increase initial resistance. A series of relaxations allows corrosive atmosphere to enter and deterioriate the joint. A connector is "on the way to failure" when contact resistance produces a 0.1-v drop; a 0.27-v drop usually means a totally damaged connector and melted conductor under fault conditions. Thus, fault current or duty rating must be in the specification.

Allowed on 120-V House Circuits

Unit air conditioners drawing not more than 12-amp running current and 46-amp locked rotor current should be allowed on 120-v house circuits. This was recommended by the EEI-ARI-NEMA air conditioning committee, said John Anderson, Philadelphia Electric. Also recommended was rating of central air conditioners on a Btu/hr or tons basis, rather than on hp. To take effect this summer is ARI's Standard 210 covering application of unitary air conditioning equipment.

Recent advances in underground practice were presented by John J. Ruechert, Baltimore G&E. Void-free filling of 34.5-kv potheads with a semi-solid compound is done in these steps in the shop: Preheat pothead and cable to 175F by successive fillings with transformer oil initially at 230F; fill and flush with compound through standpipe until compound is bubble-free at pothead vent; apply 30-psi nitrogen for 12 hr or longer. In another development, current paths in cable sheaths are interrupted, for use of a fault-intelligence system, using plastic inserts compounded from epoxy resin, plasticizers, and hardening agents. Six plastic inserts with neoprene-tape oil seals have performed well on direct-buried, lead-sheath, neoprene-jacketed 33-kv cable for over two months to date.

Pre-lubrication of pipe for 120-kv pipe-type cable, plus lubrication of cable during first half of the pull, will allow pulls of up to 4,000 ft of 1,500-MCM cable. The last development is a pipe-cable fault locator which automatically records distance from terminals to a cable fault. In this scheme, two time-interval meters record the time required for fault pressure waves to reach the circuit terminals. The interval timers, recording time in 100-microsec units, convert speed of sound into distance to the fault.

A transformer-protector combination can carry 150% of transformer nameplate rating under contingency conditions without serious loss of life when two changes are made, said A. F. Newman and L. Falkenstein, Consolidated Edison Co. Replace class A insulation on network protector relays, CT's, and structural members with class H; replace standard Y25 and Z50 fuses with a design having about 50% the I^2R losses.

Mechanization Successful

A new portable 250-kv dc and impulse set for cable testing and fault locating was described by R. S. Diggs and J. E. Johnson, Philadelphia Electric. The set provides from 20 ma at 250 kv to 100 ma at 125 kv and pulses at any voltage up to 125 kv—4μf at 40 kv down to 0.25μf at 125 kv. Input to the set during impulse testing will not exceed 1.5 kva from a single-phase 120-v source. Higher outputs are available from 240-v, 3-wire, single-phase sources.

During six years' experience with a work-simplification program, said John Bittner, Cleveland Electric Illuminating Co, total savings are estimated at over $4 million, or $2.58 for each dollar spent. Of almost 14,000 proposals received from 3,243 employees, 84% were put into effect. Success of CEI's mechanization program has been remarkable, said Bittner. Completely new machines were developed and machines used by other utilities or industries were adapted to provide mechanical or electrical means to aid in performing work. These two programs were combined with a third, standardization, into one operations-improvement program to eliminate overlapping and duplication of effort, and to reduce confusion, improve employee understanding, and improve publicity.

Reasons for the low lost-time accident rate of Baltimore G&E's electric distribution department could be found in a safety discussion by three company speakers. L. G. Smith said supervisors in engineering and operations have direct responsibility over the three basic causes of accidents—unsafe design, inadequate supervision, and individual unsafe acts. Accidents will not be reduced if line and staff people do not do the "safety" job effectively and cooperatively.

Safe working practices are enhanced through use of equipment designed from a safety standpoint, said J. H. Winter in describing more than 20 devices for safe work on overhead and underground systems.

R. H. Coleman said the staff safety man contributes by maintaining an objective viewpoint toward safer working conditions, by looking at safety from the overall company view, by promoting safety awareness and recognition of safe work, and by continually encouraging the support of top management.

Steam Turbine Returns to Drive BF

First used at Huntley Station 40 years ago, steam turbines now provide many benefits in driving boiler-feed pumps for 200-Mw unit

R. P. MOORE, Chief Mechanical Engineer, System Project Engineering Dept, Niagara Mohawk Power Corp, Buffalo, N. Y.

In the design of boiler-feed-pump drives, the pendulum is nearing completion of its back swing—first from steam-turbine drives, then to motors, and now back to turbines. Steam has returned, bringing numerous advantages to the driving of BF pumps at Huntley Station of Niagara Mohawk Power Corp.

A 200-Mw, 2,400-psi, 1,050/1,000F unit with two full-sized BF pumps driven by steam turbines recently went into service at Huntley. This unit and a duplicate will replace 95 Mw in four units constructed about 40 years ago. In line with recognized practice of that day, the BF pumps and all other auxiliaries of the original units were driven by steam turbines.

The return of the turbine-driven pump is the result of developments never contemplated circa 1917. With the increases in steam pressure common in recent utility thermal generating plant design, the percentage of gross output required to drive the BF pump has risen to a sizable figure. This is 2.5% (6,800 hp) for Huntley's 200-Mw unit, which uses two full-sized BF pumps. With motor drive this power would be subtracted from the net salable output of the unit.

Three other reasons favor a turbine drive for the BF pump:

1. The selection of speed is not limited to those obtainable with 60-cycle motors, but may be any speed most suitable for the pump. Fortunately, that speed suitable for the pump is also suitable for the turbine. The Huntley unit reaches 7,000 rpm at full load.

2. The relatively high rotative speed leads to another advantage. The number of stages in the pump can be reduced (4 for Huntley), resulting in a short bearing span and a stiff rugged shaft. The turbine itself also has small rotating parts.

3. Another advantage is the variable speed inherent in the turbine drive. At Huntley the standard three-element feedwater regulator operates directly on the turbine governor to feed the boiler as required by the load and drum level.

The BF-pump turbine is not an independent unit but is fitted into the heat balance of the main unit as shown on the diagram. Normally the turbine takes steam from the cold reheat line on its way to the reheater and exhausts into the deaerator. Two high-pressure feedwater heaters receive their entire supply of steam from the small turbine. No steam is returned to the main unit. This eliminates the need of automatic valves, which must be operated by the main-unit governing system to avoid dangerous overspeed in case of trip-out.

It would be impossible to start the unit with the simple arrangement just described. For this purpose and for light load operation, when the pressure at the reheater would be too low, high-pressure steam is taken from a point between the primary and secondary superheater. This source is also controlled by the BF-pump turbine governor and is automatically opened when the valves controlling the steam from the cold reheat line are fully open and more steam is needed to pump the water (see diagram).

A 300-hp motor-driven booster pump assures adequate suction pressure for the high-speed boiler feeder. It is used at start-up from cold to feed the boiler through the BF pump until about 100 psi is reached.

Turbines Gain as BF-Pump Drives for Large

Choice among condensing and non-condensing turbines, motors, main-unit shafts, gas turbines calls for computers

LEONARD M. OLMSTED, Managing Technical Editor

Use of steam-turbine drives for the boiler feedwater pumps at Huntley and several other recent station projects has been hailed by some engineers as a new trend for generating units of 200 Mw and larger. Among the advantages they claim are these:

1. Plant thermal efficiency is improved, particularly where the pump turbine is coordinated with the main unit's steam cycle.

2. Plant investment can be pared by eliminating costly breakers and controls for motors and omitting hydraulic couplings.

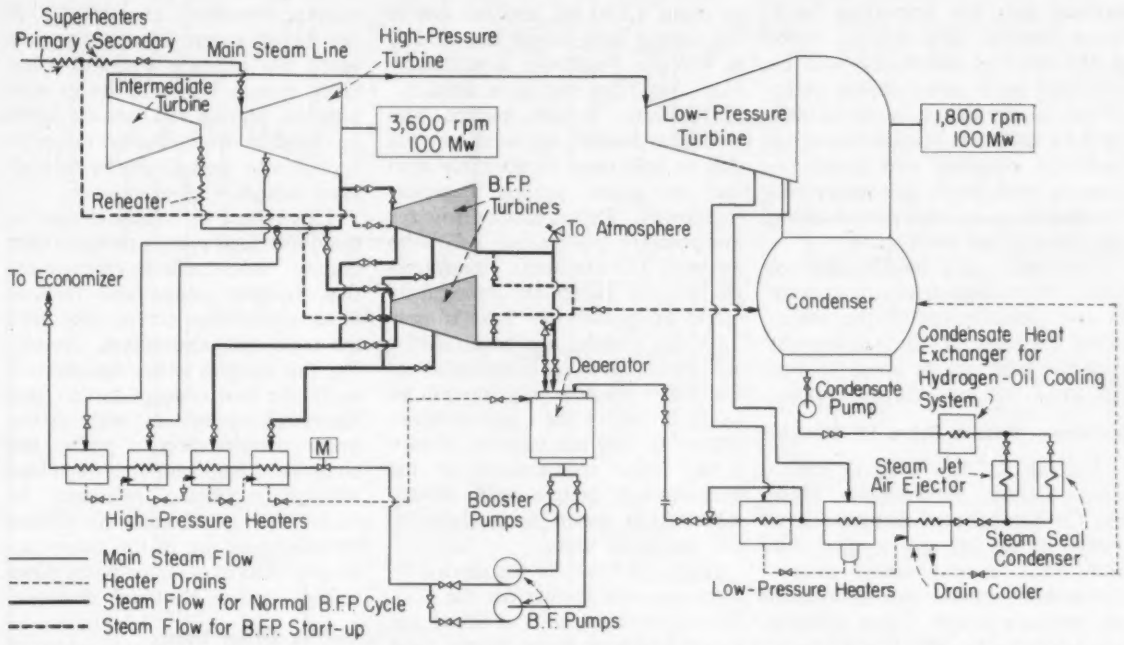
3. Problems associated with starting extremely large motors from station service are eliminated.

But motors still remain the most accepted pump drives for generating units in this size range. Their proponents see no difficulty in supplying the power requirements and contend that investment savings outweigh the small thermal advantage of turbine drives. Some engineers consider the added complication of emergency starting a turbine in older plants so objectionable that they are replacing them with motors.

Other designers have adopted still another approach—driving feed pumps from the main unit shafts. They claim better efficiency from direct connection to the main unit, in addition to investment savings and relief from motor starting.

Selection of pump drives for large units today is clearly in a state

Pumps at Huntley, Replacing Motors



STEAM-TURBINE DRIVE for boiler-feed pump of 200-Mw unit at Huntley Station is not an independent unit, but is fitted into the heat balance of the main unit as shown here. A motor drive would consume 2.5% of the net salable output

Above that level the turbine pump develops the pressure as required by the boiler. During these start-up conditions, when the deaerator can not condense all the turbine exhaust, the excess is diverted to the main condenser or, in emergency, to atmosphere.

Another advantage of the turbine-drive arrangement is that the deaerator pressure, and hence the BF suction pressure, is no longer proportional to the load on the main unit but ranges only between 40 and 20 psia. This tends to minimize the danger of losing pump suction when the main unit loses all or a large part of its load with the resulting likelihood of damage to the BF pump. The booster pump also adds to the security of the boiler feeder under these conditions.

Units but Motors Still Hold the Lead

of flux. Not only must plant designers choose between full-size pumps, half-size pumps, and third-size pumps but they must also evaluate at least three power sources. One engineer has acknowledged evaluating over 100 feasible combinations before selecting the final feedwater-pumping plan for a new unit. More problems of this magnitude will drive designers to computers for analyzing tomorrow's plant designs.

Interest in turbine drives apparently began with the adoption of a 6,230-hp, 5,500-rpm non-condensing unit to drive the single 4-stage pump of Appalachian Electric Power Co's Glen Lyn Plant. (EW Nov. 28, 1955, p 66). Steam for the drive turbine is taken at about 500 psi 700F from the 225-Mw main unit's high-pressure cold reheat line and exhausted at about 85 psig to No. 5 feedwater heater and the low-pressure section of the main unit. Two extractions from the pump turbine give steam with most of its superheat removed for additional feedwater heaters.

Startup steam for the Glen Lyn pump turbine is taken through stop and control valves from the main unit steam line. This connection enables the main pump to take over from a small motor-driven pump after boiler pressure passes 400 psi.

Similar turbine-driven pump installations are being installed on 7 additional 225-Mw units at other locations on the American G&E system. They are expected to add about 2% to each unit's net output and improve its heat rate by upwards of 20 Btu per kwhr.

Larger generating units now under construction likewise include turbine-driven feed pumps. But integration into the steam cycle is somewhat different, particularly for supercritical plants. The two 7,650-

hp 7,575-rpm feed pump turbines of Cleveland Electric Illuminating Co's 250-Mw Avon unit will take steam from the cold reheat line and exhaust into the first stage feedwater heaters. (EW July 2, 1956, p 18). Startup and reserve will be provided by a motor-driven pump of similar size driven by two 4,000-hp 4-kv motors in tandem through a hydraulic coupling and speed increasing gear. Only one motor will be used to start, the second being energized at full shaft speed.

Unit output will be 250 Mw net when two turbine-driven pumps are in use; substitution of the motor drive for one of these improves expected heat rate by about 15 Btu per kwhr but cuts the net output.

Turbines, Motors Drive SP Pumps

For the 325-Mw units at Eddystone Station, Philadelphia Electric Co has adopted turbine-driven pumps to top off and regulate the flow from constant-speed motor-driven low-pressure and intermediate- pressure pumps. These turbines are 5,000 hp for No. 1 unit which requires up to 6,400 psi discharge, and 4,000 hp for the 4,600-psi discharge of No. 2. The turbine-driven pumps are called upon to boost water flow after the main units reach about 30% load, so they take steam from the first cold reheat line at about 1,150 psi and exhaust to the second cold reheat line at 300 to 400 psi. Feedwater is heated by extraction from the main units.

Duplicate ⅔-size pumps and feedwater heaters are used on each unit to hold them to desirable sizes and to guard against complete shutdowns. Drive motors for the low-pressure pumps are 4,000 hp for both 325-Mw units. Intermediate pressure pumps are powered by 4,500 hp motors for No. 1; only 2,250-hp motors are required for No. 2 because of its more conservative boiler pressure. Startup will be handled with the motor-driven pumps as they are capable of supplying water requirements of the once-through boilers until enough supercritical steam is available to roll the main units.

American G&E Co has carried integration even further for the 450-Mw supercritical units at Breed and Sporn Stations. Pump drives there will attain spectacular proportions in condensing turbines exceeding 20,000 hp. Steam for these will be extracted at about 94 psi from the main units' IP turbines and expanded into separate sections of the main condensers. Connected in this manner they divert over 150,000 lb per hr of steam from each main unit's low pressure end and materially reduce losses in its exhaust annulus. Startup and light loads will be handled with smaller full-pressure pumps gear-driven by wound-rotor motors.

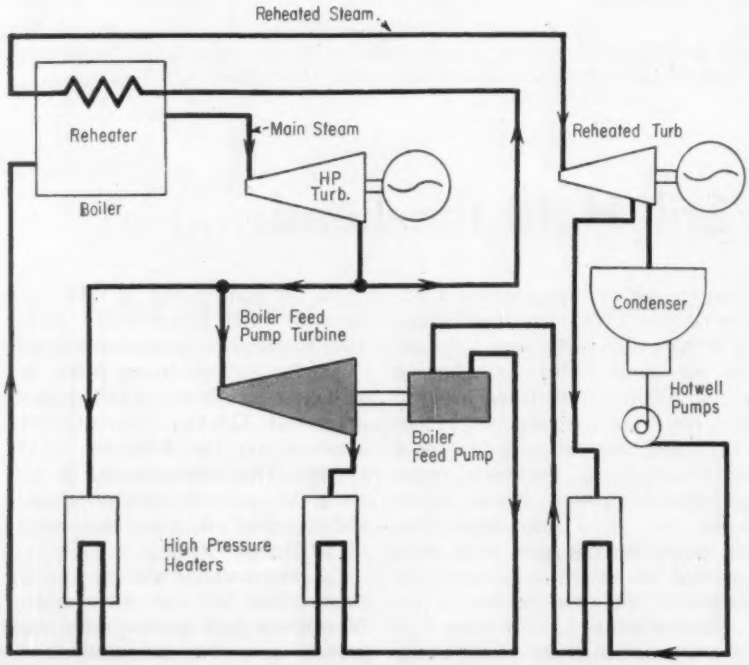
This return to turbine drives for the boiler feed pumps on large generating units reflects recognition that modern pumps and turbines have availability comparable with the main units themselves. Accepting this enables plant designers to carry the unit concept farther into the auxiliary system with consequent simplification of piping and controls. Pump output is regulated without sacrificing efficiency by varying its speed with the turbine throttle. And use of the steam turbine instead of a motor pares down station service electrical demands.

Motors Often Used

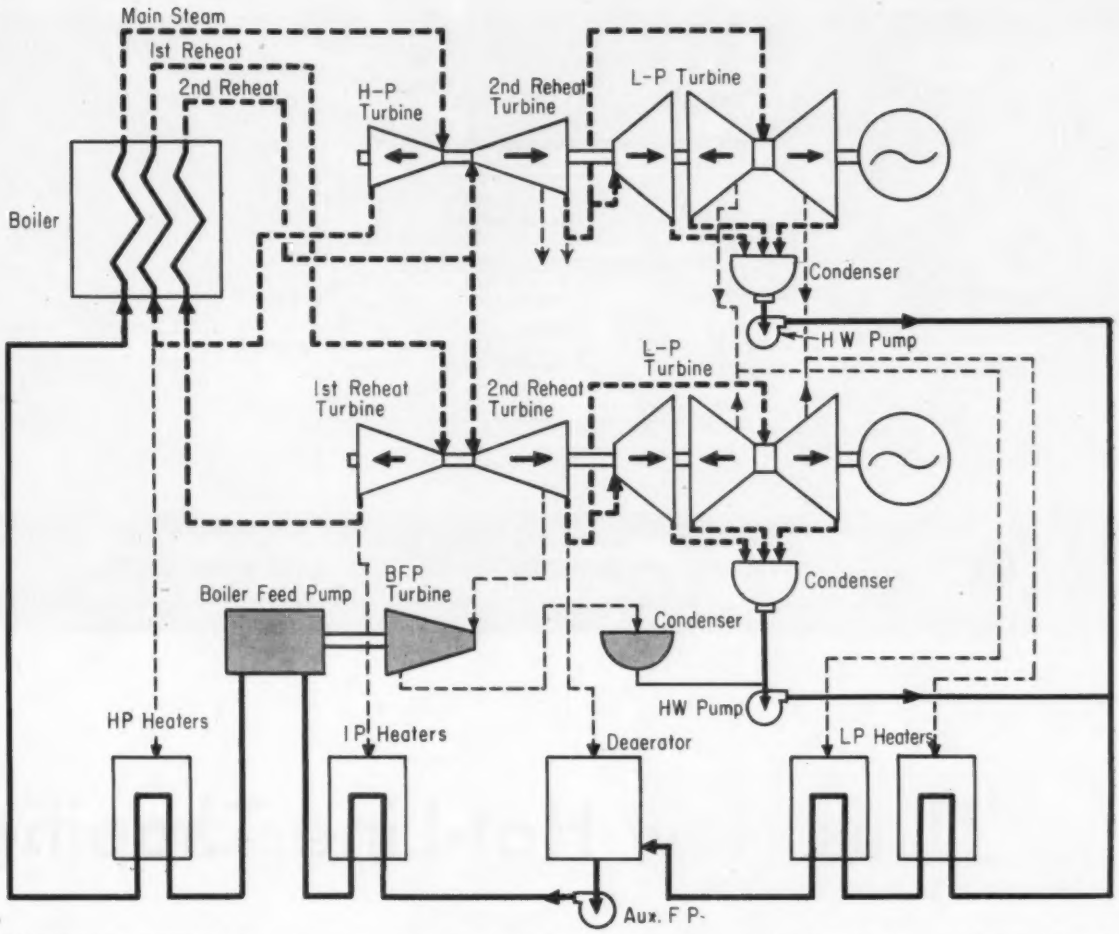
But other drives are by no means out of the picture. Several of the cited installations use motor-driven pumps in combination with the turbine-driven units. Some include the motor drives in their normal running order while others depend upon them for startup or standby. And many new large units will use motors exclusively.

Motors drive the boiler-feed pumps of Commonwealth Edison Co's 275-Mw 2,000 psi Will County unit and Detroit Edison Co's 320-Mw 2,400-psi River Rouge No. 3. The former unit, which set an 8,885 Btu per kwhr heat rate soon after startup (EW, Oct. 21, 1957, p 50) has its 3 60% pumps driven by 4,000-hp 4-kv motors through hydraulic couplings which regulate water flow. Detroit also adopted hydraulic couplings for its 5,000-hp 4-kv motor drives after finding that 30 Btu per kwhr savings with turbine drives fell short of carrying the additional investment for 3 turbine-drives plus a spare motor-driven pump (EW, Feb. 18, 1957, p 88).

The feed pumps of Pennsylvania P&L Co's 300-Mw 2,400-psi Brunners Island unit will have three 4,000-hp motors direct coupled to 3,600-rpm pumps. Two of these will supply almost full load require-



NON-CONDENSING TURBINE usually takes steam from main unit before reheat and exhausts into feedwater heaters. Extraction may supply several heaters



CONDENSING TURBINE takes steam from point near crossover to main unit's low pressure section and exhausts into condenser. Thus connected, it diverts enough steam from the main unit's exhaust annulus to alleviate turbulance losses

ments, permitting rough regulation of flow by starting and stopping the third pump. Fine adjustments will be made with throttle valves. Elimination of gearing and speed-controlled drives made this solution the economic choice, after analyses proved that motors up to 6,000 hp could be started.

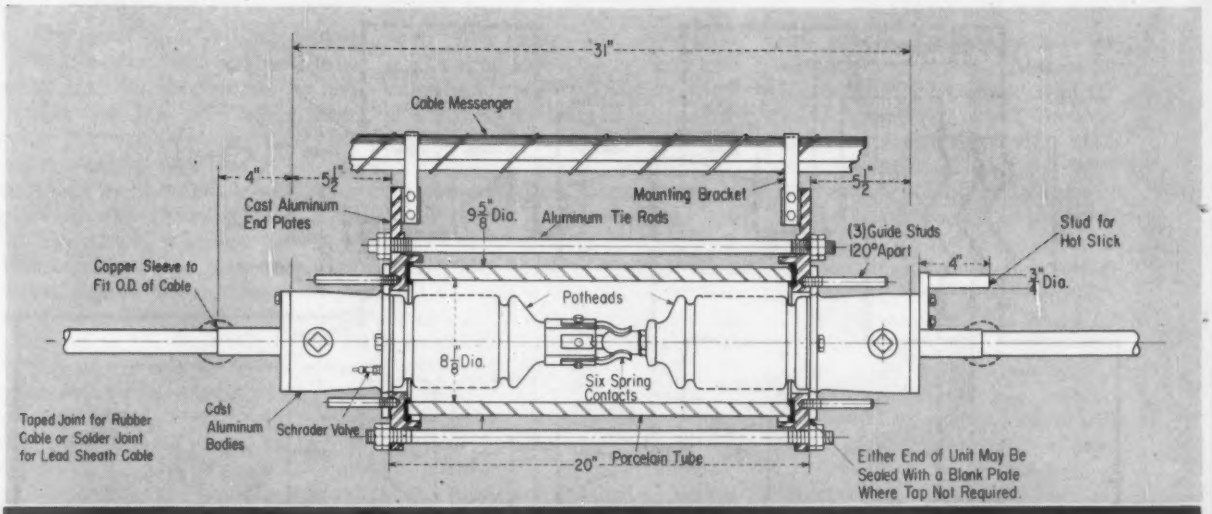
Motor drives also have been selected for 8 new generating units ranging from 200 to 275 Mw for utilities in the Southeast. Most of these will have 3 half-size pumps driven by 4-kv motors of 3,000 to 4,000 hp. Output will be regulated by valving except in two units which will use hydraulic couplings.

Shaft Drives Economical

Other designers see advantages in coupling feedwater pumps to the main unit's shafts as at Consolidated Edison Co's 335-Mw 2,000 psi Astoria No. 3 and Arthur Kil units. A single 12,000-hp 3,600-rpm pump will be connected on each unit via mechanical disconnects and hydraulic couplings will regulate water flow. Backup and startup will be provided by half-size pumps driven by 6,000-hp 4-kv motors and regulated by valving. Substantial investment savings will be obtained in this manner.

Public Service E&G Co likewise selected shaft-driven pumps for the new Bergen Station. (EW, Feb. 18, 1957, p 86). Each of the two 290-Mw 2,350-psi cross-compound units will have a half-size pump geared to each main shaft. Water flow will be regulated by hydraulic couplings. Backup for the shaft-driven pumps, and startup, will be a duplicate pump gear-driven at constant speed by a 4,500-hp 4-kv motor with output regulated by valving to save cost of another hydraulic coupling. Savings from omission of additional motors and electrical equipment are estimated at $\$1\frac{1}{2}$ million and the plant's electrical consumption will be pared by 6,400 kw.

Gas turbines also may play a part in driving feed pumps. Units of 3,000 to 7,000-hp operate at speeds suitable for direct drives. And heat in the gas turbine's exhaust could be reclaimed by adding it to combustion air for the boiler or passing it through a feedwater heater. Studies show a gain in plant net output and in heat rate (EW, July 11, 1955, p 94; Aug. 1, 1955, p 30). No installations have as yet been reported but gas turbine drives have been considered for several proposed plants.



First step toward wide adoption of aerial cable is this hot-line tapping chamber using standard potheads. Cross section is at right

This New Hot-Line Tapping May Solve Your Aerial Cable

A first design of a hot-line tapping chamber for aerial cable, soon to undergo field tests at Long Island Lighting Co, may be the key to the breakthrough to more widespread use of aerial cable. By overcoming the existing limitations of aerial cable, this new device would enable the utility industry to realize the full potential of aerial cable as an ideal solution to the widespread problem of outages caused by trees contacting open conductors.

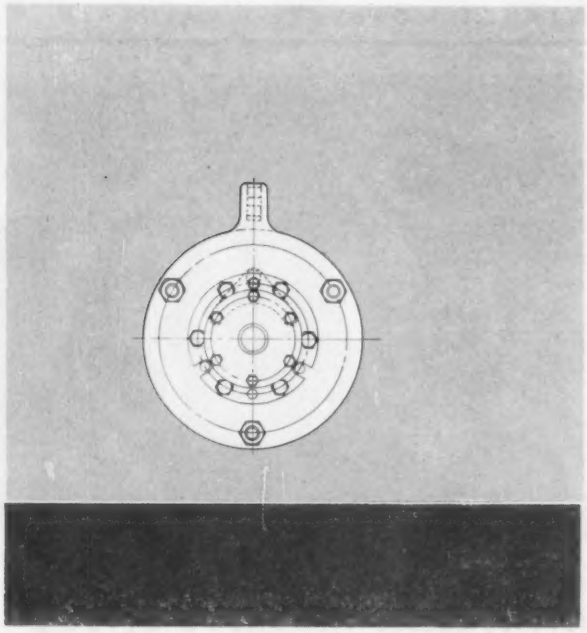
But aerial cable is inflexible today. The necessity of working it dead and the long time required to splice it have limited its use to express runs often overbuilt by open wire to pick up local load. On Long Island, the compromise solution to the tree problem has been an extensive maintenance tree-trim program and the use of polyvinyl-chloride-covered conductors.

Yet aerial cable could be made flexible to handle load growth. This new design is the initial step in an effort to develop a suitable tapping device which can be built into a new aerial cable run, permitting easy tapping while the cable is energized. Aerial cable could then solve the tree problem in areas where covered wire and expensive routine tree trimming are inadequate. It could also be used in congested commercial areas where adequate building clearance cannot be obtained with open wire.

The first step to wider use of aerial cable is the design above. Worked up jointly by Lilco's Distribution Design Div and G&W Electric Specialty Co, it represents a hot-line tapping chamber to which are attached standard potheads for cable entrances suitable for 15-kv leaded or non-leaded aerial cable.

Device Is Made of Porcelain and Aluminum

The tapping chamber is made of porcelain and aluminum, filled with air, and clamped to the messenger wire with mounting brackets, which also ground the device. The lineman's safety is assured



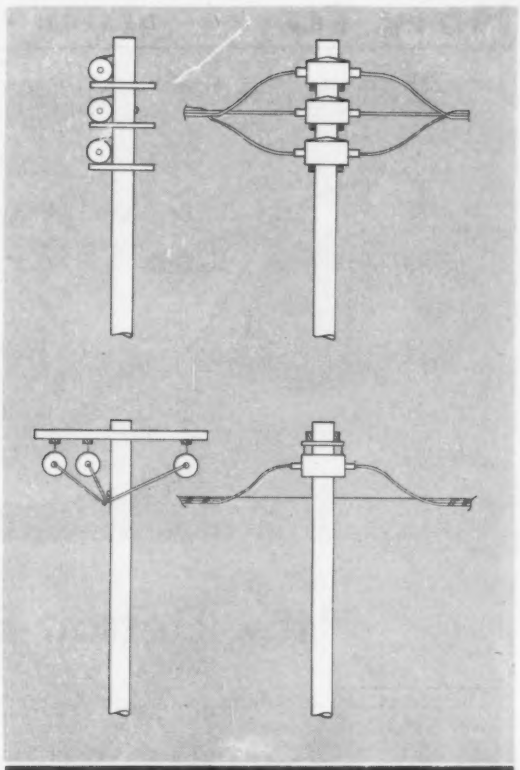
Chamber Problems

because each pothead and the hot stick will be grounded through the guide studs before contact is made within the chamber.

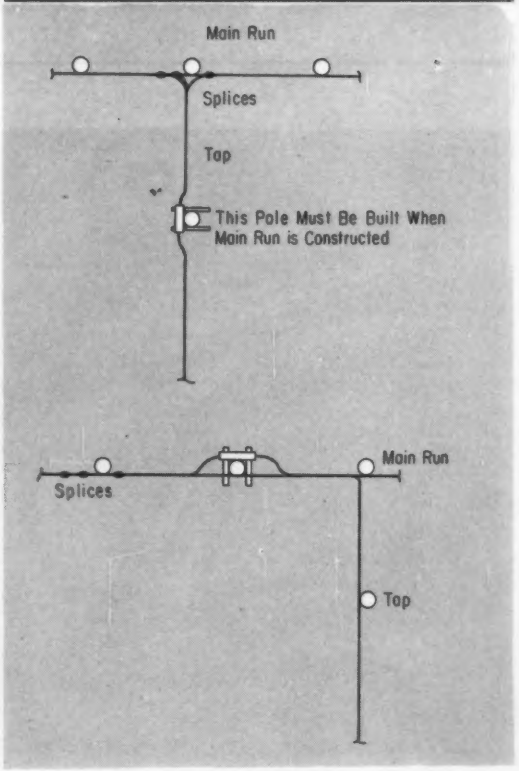
Typically, as shown opposite, the device would be branched into a cable run during initial construction at those locations determined by immediate needs or load forecasts. A blank plate in one end would be removed when a branch must be tapped into the energized main run, and the new pothead could then be plugged in safely.

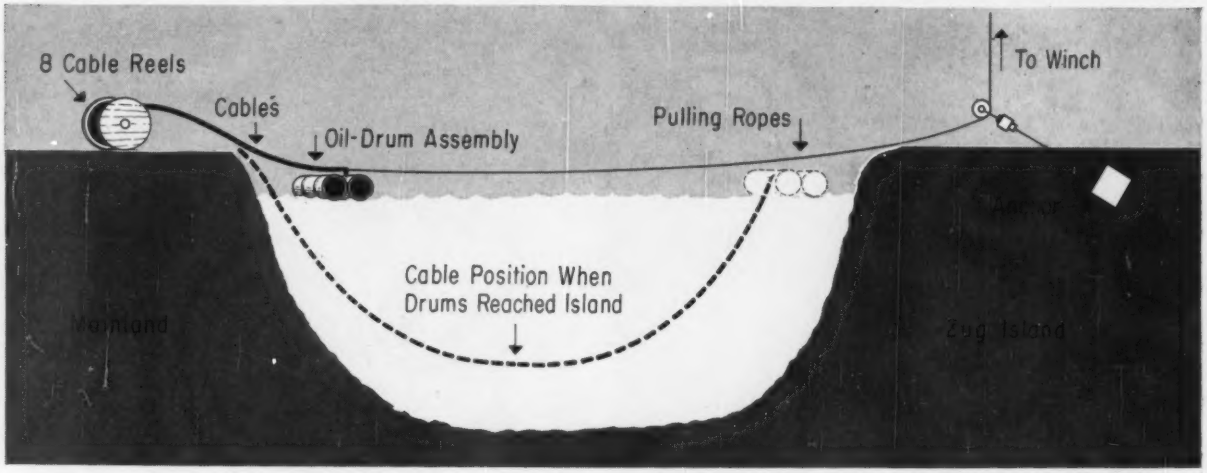
Many will argue that this device has shortcomings. It is fairly long (31 in.), heavy (96 lb), and makes a somewhat bulky poletop configuration by Lilco standards.

However, the potential of the device for overhead and possibly underground use (to reduce splicing) warrants extensive tests and field trials. Subsequent analysis of these trials should improve the product and make possible more use of aerial cable.



In vertical or horizontal configuration (top), the device would be branched into initial cable runs



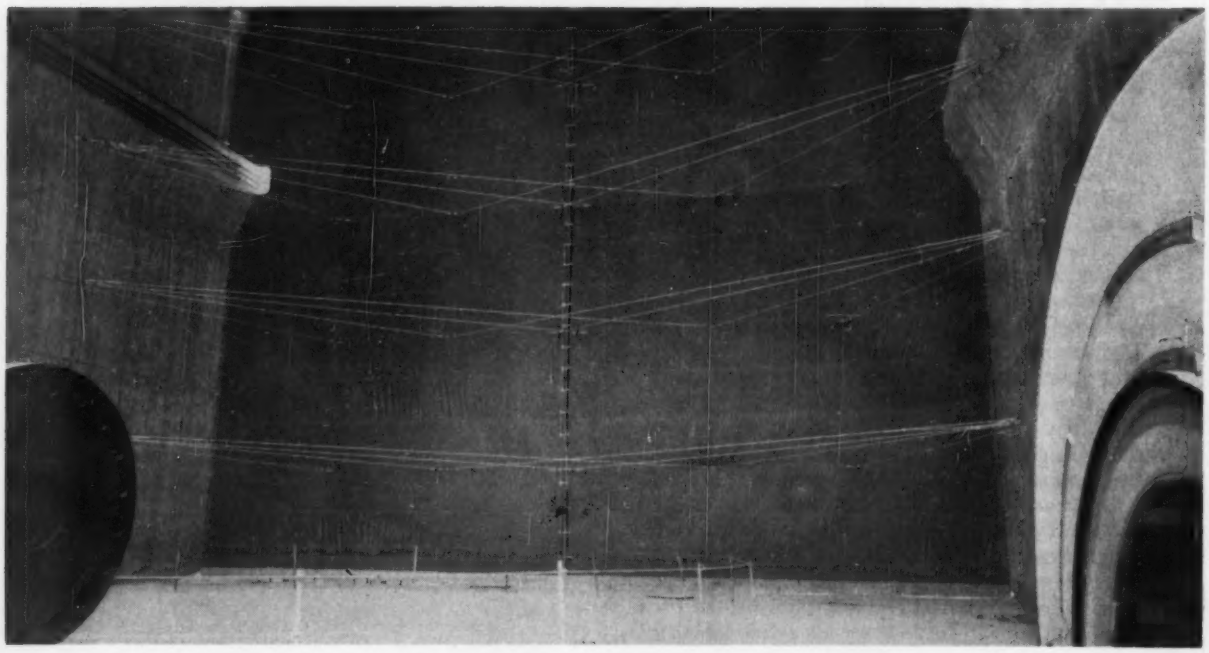


How Detroit Edison Made an Easy River

The difficult task of pulling cables across the muck of a river bottom can be made easy by simply keeping the cables off the bottom. Detroit Edison Co did this recently when it floated eight cables across Rouge River on oil drums, then dumped the cables to the bottom.

The cables ran from Detroit to Zug Island to feed a new substation. Six were 24 kv, 3/c, 350 MCM, paper and lead, shielded armored; two were 4,800 v, 3/c, 450 MCM, paper and lead, armored. Here's how it was done:

A single assembly of six 55-gal drums, attached to the leading edge of all eight cables, provided enough buoyancy to keep the cables off the river bottom. The drums were secured together (see photos) with steel straps and a steel angle iron. The ¼ by 3-in. straps were welded to the drums; the 4 by 4 by ¼-in. angle was welded to the straps; and two U-bolts were fastened



Cable Crossing

to the angle for pulling the entire drum assembly.

The cable reels were set up on the mainland, and the drums placed at the river bank. The cable ends were then secured to the angle iron on the drum assembly with U-bolts. A pulling rig on the island used a truck winch to pull the drum assembly across the river. Once across, more cable was pulled from the reels, and the cables were allowed to drop into a 7-by-10-ft trench.

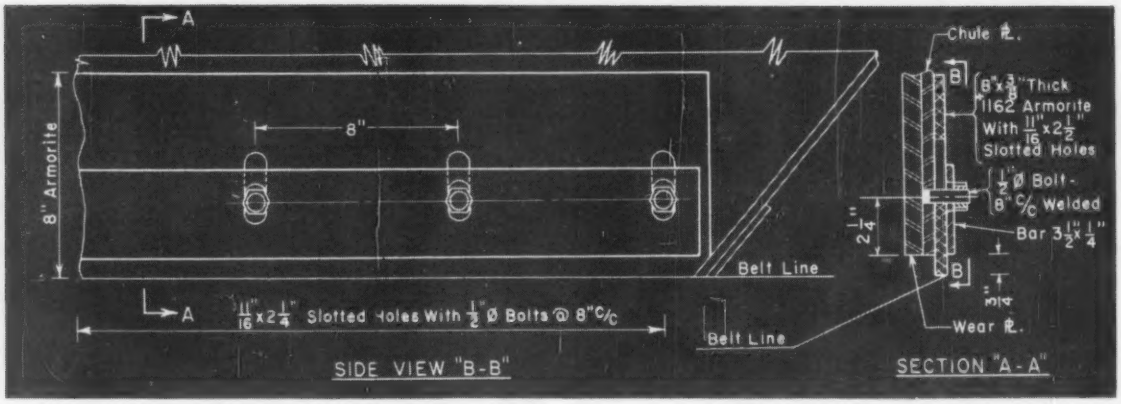
Nylon Keeps Winter Out at The Dalles Dam

A giant vinyl-coated nylon tarpaulin is keeping out the elements at The Dalles Dam powerhouse of the Corps of Engineers, making it possible to operate main generators and work inside the structure even though one end of the plant is missing. If the 60 x 80-ft opening were not closed, frost accumulation, moisture and blowing dust would damage generators in operation and those still under construction. The $5,000 net cost of installing the nylon tarpaulin is less than 25% of the estimated cost of a closure of rigid materials.

To cover the giant opening, rigid construction would have involved substantial and expensive structural members to withstand expected wind pressures. A large tarpaulin to do the job had to be a fire-resistant nonshrink material strong enough to resist heavy winds. A virtually tearproof vinyl-coated nylon having a tensile strength exceeding 200 lb per lineal inch was selected.

To facilitate fabrication and installation, the tarpaulin consists of two halves laced together vertically at the center with the joint covered by a weatherflap. Top and side edges were sealed by turning the material back on itself and sewing it to form loops. Pipes through the looped material are clamped to a roof girder and to powerhouse walls. The bottom was secured by lacing the tarpaulin to planks bolted on edge to the floor. This permits some vertical movement but still maintains a seal.

To prevent flapping and overstressing during high winds, both inside and outside surfaces of the tarpaulin are guyed at 32 points to the powerhouse walls. For added strength and to reduce stretch due to guying tension, 2-in.-wide nylon webbing was sewn at 12-ft horizontal intervals across the entire width. Guy lines attached to steel D-rings secure the nylon webbing at 12-ft intervals. Guys of 7/16-in. nylon rope have a high breaking strength and great elasticity, which keeps them taut under all conditions of wind and temperature.



Conveyor Chute Dust Seal Improved

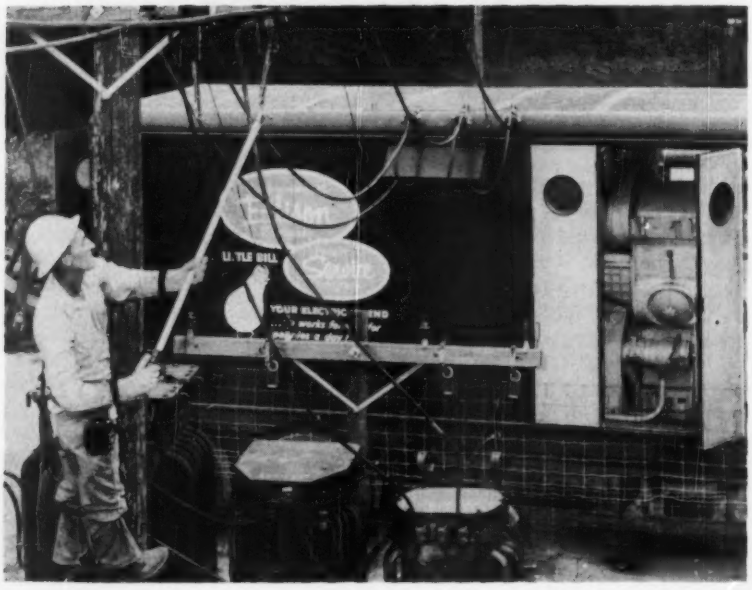
OTTO MOLMEN, Material Handling Engineer, American Gas & Electric Service Corp, New York, N. Y.

The chute plate shown, when placed 1¼ in. from a coal conveyor belt, keeps pyrites and other impurities in the coal from lodging between the belt and chute plate.

The Armorite seal can be adjusted by loosening the nuts on the outside. As it is reversible, it lasts twice as long as older seals. The material is purchasable in 8-in.-wide strips, either plain or punched with the proper slots. The bolt spacing of punched material, however, must be uniform the full length of the seal.

This method of adjusting and replacing dust seals supersedes a more time-consuming operation. The older method took 100 manhours a month and about 20 hr down time for the conveyors at one plant. It also required removal of the outside nuts, a helper inside the chute holding the bolts from turning. It involved cutting and adjusting the Armorite seal and replacing the bolts and nuts. The average seal has to be adjusted or replaced about every six weeks.

Mobile Generator Avoids 3-Day Outage



A 500-kw mobile diesel generator maintained service continuity for 3 days while a substation was taken out for insulator washing and transformer replacements. Contamination of insulators on a line and at a step-down transformer bank on Commonwealth Edison Co's system at Streater, Ill., necessitated washing of insulators. Commonwealth Edison moved its mobile generator to the spot, synchronized it with the system, and picked up the 500-kw load of the two customers.

The effected portion of the feeder and the station were removed from service. During the 3-day period, transformers at a nearby station, served from the same line, were replaced to take care of growing load.

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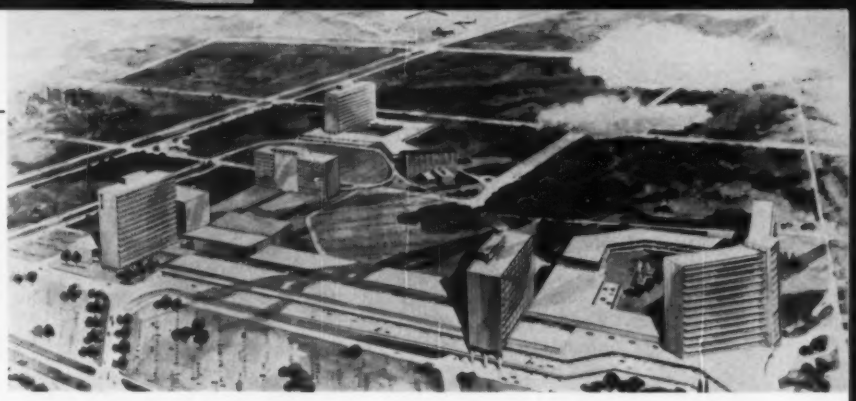


Project Has 13.2-KV Distribution

G. M. BOSTOCK, Vice-President, Exchange Park, Dallas, Texas,

D. S. BRERETON, Manager, Power Application Engineering, and

D. S. BAKER, Power Application Engineering, General Electric Co, Schenectady, N. Y.

The walls are now rising in Dallas on a $125,000,000 "city within a city" known as Exchange Park. The 130-acre project features an "up-to-the-future" power distribution system for 26,800 kva of highly reliable load with adequate provision for load growth, economical installation and operation. It will be one of the nation's most completely integrated commercial developments when completed in 1960.

In addition to a 14-floor bank building, 10-story Braniff building and a central utility building, all completed, it will include two 10-story office buildings, a 1,000 room hotel, a department store, a medical center and 150 bed hospital, about 150 retail shops and parking facilities for 15,000 cars serving more than 15,000 permanent occupants, plus shoppers and hotel guests. The entire Park which will be completely air conditioned including underground parking areas and covered sidewalks will have a total substation load of 26,800 kva.

Two 13.2-kv service feeders, each from a different point in the Dallas Power & Light Co system, bring in primary power. By using feeders from two separate points, power to the entire park will not be lost by failure of one feeder, nor will both feeders be jeopardized by a local disturbance in the utility system. This principle of duality of services is carried on down to the substation bus in each building to provide a secondary selective system. Because the main thoroughfare divides the project, each service feeder is fed to two locations, the bank building and the utility building.

The 13.2-kv power is metered and distributed to the various load centers from two line-ups of 13.8-kv metalclad drawout switchgear. A tie breaker allows the two buses to be connected if one primary service fails. From the feeder breakers, power is distributed at 13.2 kv.

Largest Motor is 300 HP

Transformation to an intermediate voltage, i.e., 2.4 or 4.16 kv, could not be justified, since there are very few motors which can be economically served at these voltages, the largest motor being 300 hp. If a distribution voltage below 600 v had been used, high interrupting capacities would be required and feeders would have to carry about 1,000 kva for up to 1,300 ft. These would be very expensive and have very poor voltage regulation.

Installed in basement areas or along the roof of the service tunnels, each 13.2-kv feeder consists of a 300-Mcm cable per phase in rigid conduit. With this type of installation, feeder conductors are isolated from personnel, moving vehicles, and from fault disturbances on adjacent circuits to provide a safe, reliable distribution system. Each feeder can handle approximately 7,000 kva and can carry the loads of both feeders if one cable fails.

With primary power being purchased, a secondary voltage of 480Y/277 was chosen for distribution from load center unit substations. Selection was based on the substantial savings that could be realized from the reduction in feeder copper requirements compared to those of 208Y/120 volts. The principal loads served from the substations are motors at 480 v, general area fluorescent lighting at 277 v, and miscellaneous office equipment loads at 120 v. This last load is served by 30 45-kva dry-type stepdown transformers on each floor. Savings realized on branch circuit wiring, feeders and risers, substation equipment, and motor control equipment more than offset the added cost of dry-type transformers and 277-v lighting panels.

At each of the 12 load centers, two single-ended load center unit substations were connected in a secondary selective arrangement to form a double-ended substation. Pairs of substations normally operate as a simple radial system with the tie breaker open. In case of an outage (either forced or scheduled) of the primary feeder or transformer, the affected main breaker can be opened and the tie breaker closed to restore service from the opposite substation bus. This arrangement provides good service reliability in that essential loads such as lights and elevators can be quickly re-energized after an outage. Flexibility is superior to that

of a radial system because transformers and circuit breakers can be removed from service on a schedule without serious interruption of power. With main and tie breakers interlocked so that only two can be closed at any one time, the system is simple to operate. Short circuit requirements are not increased over that of a straight radial.

In the completed bank building, which has a total of 282,000 sq ft of floor space, power is distributed from a 1,500-kva double-ended unit substation with a 480Y/277 secondary and a 300-kva single-ended distirbution center with a 208Y/120 v secondary. The 208Y/120-v distribution center serves lighting load in the bank on the first floor and a cafeteria and retail shops in the basement, where feeders are too short to justify a higher voltage. Large motor loads such as elevators, ventilating fans, and chilled water pumps and long lighting feeders make it more economical to distribute power from the 1,500-kva unit substation at 408Y/277 v.

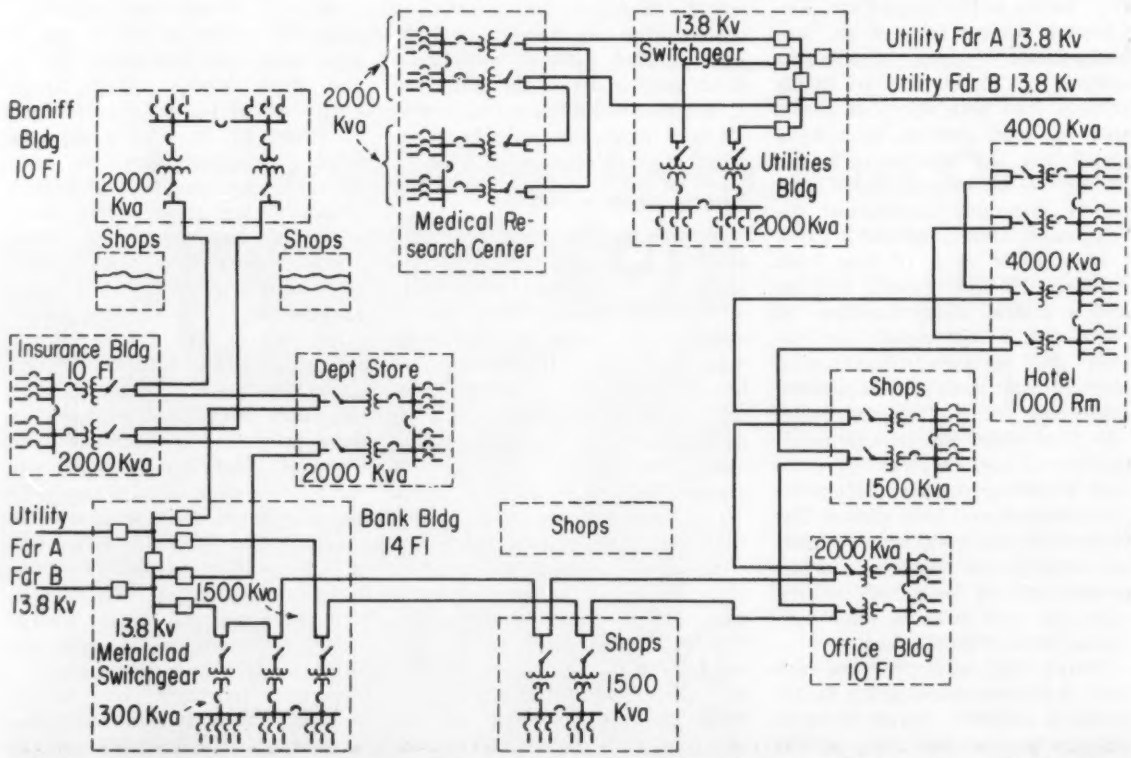
For the motor control center feeder and the lighting feeder to the upper floors, enclosed busway was used instead of cable in conduit. Advantages of the busway are ease of installation and extreme flexibility. Above the fifth floor, a plug-in busway was used; feeders were connected to the lighting panel by merely plugging in a fused disconnect switch. This method eliminated the need for cable tap boxes, saved equipment and installation.

Motor Controls in Basement

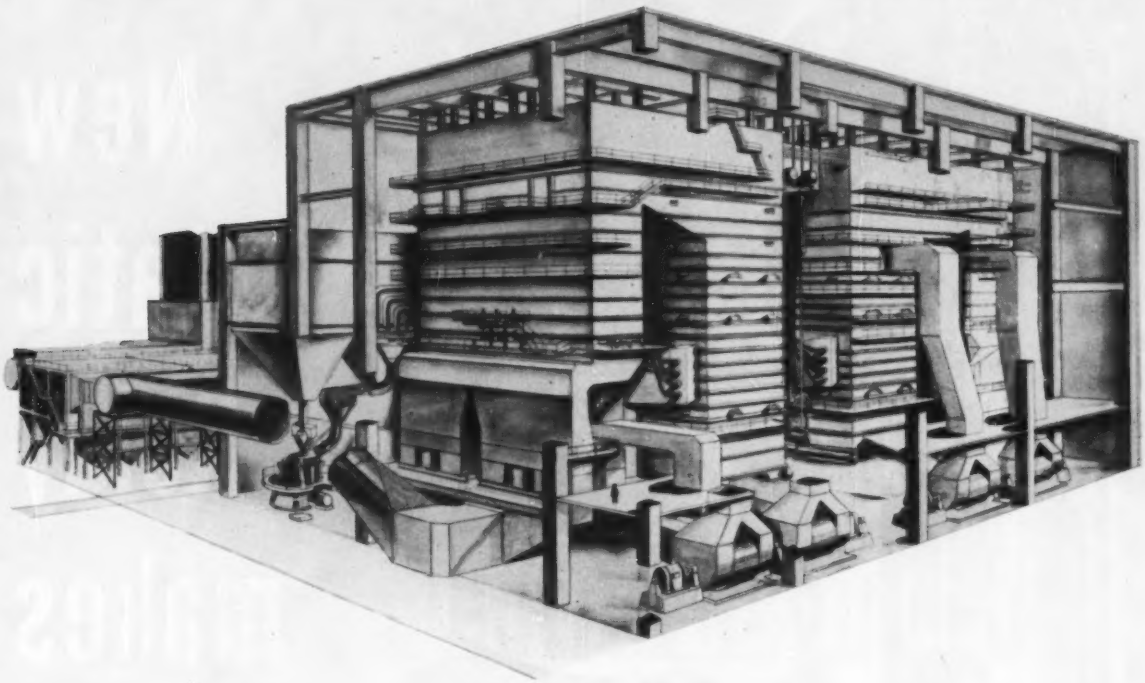
A separate feeder from the unit substation supplies the building fire pump. Power distribution panels on the roof feed the elevators and other miscellaneous motors located on the roof. All other motors are controlled from a motor control center in the basement. In addition to being centrally located, the motor control centers are easier to maintain and require less space and installation time than wall-mounted units. Principal motor load is air conditioning fans, spray pumps, and chilled water pumps.

The completed utility building has a capacity to serve a city of 36,000 persons. All power house equipment except steam driven compressor drives and two water pumps are fed from a 2,000-kva double-ended unit substation. The two largest motors, a 150-hp condenser water pump motor and a 300-hp chilled water pump motor are served directly from the substations. Compartment space has been provided for additional equipment which will be installed as the cooling requirements grow. Smaller motors such as the boiler feed pumps and the cooling tower fans are fed from a modern motor control center. General area lighting consists of fluorescent fixtures supplied from 277-v lighting panels. Instrumentation, control equipment, and incandescent lighting is supplied at 208Y/120 v from the dry-type transformers.

Architects for the project were Lane and Gamble & Associates. Mechanical and electrical engineers for the utilities plant and bank building were Blum and Guerrero; mechanical and electrical engineer for the Braniff Building, William K. Hall.



TWO 13.2-KV FEEDERS, taken from different points in utility system, serve Park. With main road dividing project, two feeds are brought both to bank and to utilities building. Duality of service is carried on down to substation buses.



British Buy Big (550-Mw) Boiler

McGraw-Hill World News—London. The 550-Mw reheat boiler unit, pictured above, is one of two rated to deliver 3,750,000 lb of steam per hr at 2,400 psi, 1055/1055F. The British Central Electricity Authority plans to install the units at a projected $112-million, 1,100-Mw steam station near Doncaster, England. Each boiler will supply steam for two 275-Mw cross-compound turbine-generators.

International Combustion Ltd (English licenses of Combustion Engineering Inc) will make the first boiler unit which is said to be the world's largest. Its capacity is described as equivalent to nine boilers of the size currently used in Britain, but it occupies half the volume and costs 35% less.

The huge boiler will consume from 205 to 220 tons of pulverized coal per hour, depending on quality of the coal which will vary over a wide range. Ash content will range from 6 to 30%; moisture from 4 to 20%.

The boiler has two furnaces, each subdivided into two sections, fully cooled with water or steam tubes. One furnace controls main steam temperature, the other reheats steam temperature. Each furnace is 68 ft wide, 28 ft deep and 100 ft high with main drums 148.5 ft above ground level.

Circulation is of the assisted type—known in this country as controlled circulation. Water tubes in the furnace and elsewhere are fed at regulated rates by pumps of a special type, driven by submerged motors.

Pulverized fuel is supplied to burners in the corners of each furnace by eight pulverizing mills, four per furnace, having a normal maximum capacity of 50 tons per hour. There are four rotary air heaters and four sets of fans per unit. Mechanical and electrostatic dust cleaning facilities represent reportedly more than 10% of the cost of the boiler plant as a whole. Guaranteed efficiency of the boiler is noted to be 90%.

Roebling Facility Increased for Paper-Insulated Cable

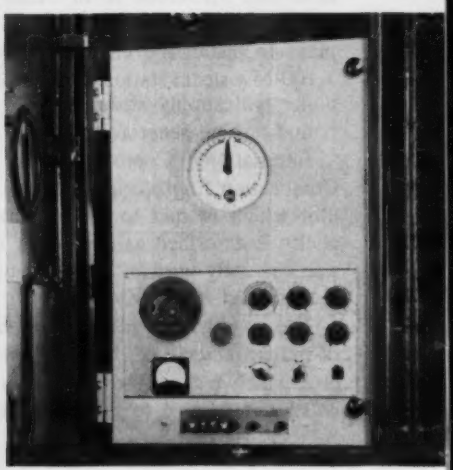
John A. Roebling's Sons Corp, Trenton, N. J., has completed a plant addition for increased production of paper-insulated cables.

The new plant has a 32,000 sq ft area and includes newly installed cabling and vulcanizing equipment. Space also has been provided for additional testing, warehousing and handling facilities.

Designed primarily for utilities, the paper-insulated cable is expected to be given wide industrial application as plant modernization and expansion programs create increasing need for electric power.

(*More Manufacturers News on p.* 83)

New Static Relay makes...



NEW SIMPLIFIED CONTROL is easy to get to, allows quick inspection. Locking knobs hold settings securely.

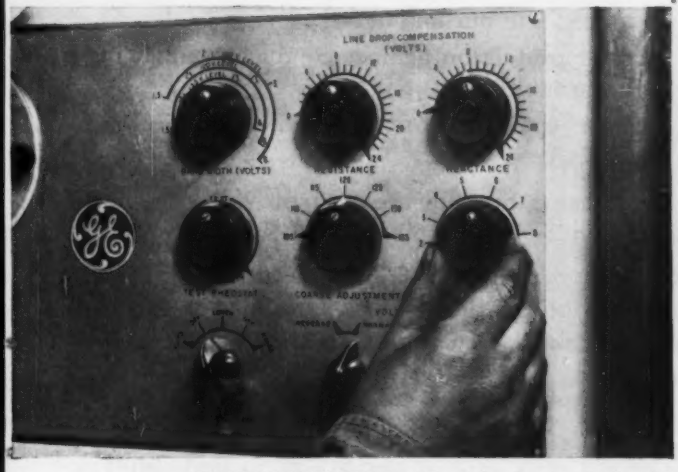
New Static Relay eliminates VRR contacts... permits fast and accurate dialing of bandwidth and voltage level settings . . . now available at no extra cost as optional feature on G-E MLT-32 three-phase regulators rated 1000 kva and below.

The new Static Relay on General Electric's MLT-32 three-phase station regulator performs the function of a voltage-regulating relay . . . but there are no contacts to maintain or replace! Along with this reduction in maintenance, the new relay permits *fast* and *accurate* setting (on an easy-to-read calibrated dial) of bandwidths from $\pm\frac{3}{4}$ to ± 3 volts at all voltage levels from 105 to 135 volts. No more need for a reference voltmeter!

The new Static Relay maintains Class-1 accuracy and all other features of the present control.

This optional feature is available at *no extra cost* on General Electric MLT-32 three-phase station regulators rated 1000 kva and below. You'll want to know more about the MLT-32 and the new Static Relay; write to General Electric Company, Section 423-26, Schenectady, New York, or contact your General Electric Apparatus Sales Office.

General Electric Regulators Cost Less On The Line

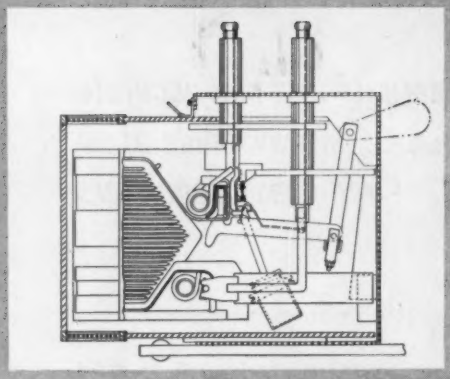


DIAL VOLTAGE LEVEL without having to check with a reference voltmeter. Accurately calibrated voltage levels clearly marked for fast, positive settings.

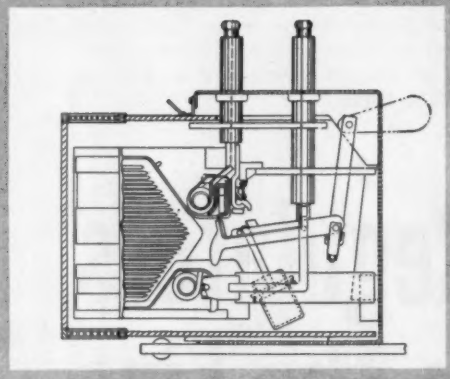
DIAL BANDWIDTH (from ± 3 volts down to $\pm 3/4$ volt). Accurately calibrated scale eliminates guesswork, shortens adjustment time to seconds.

Progress Is Our Most Important Product

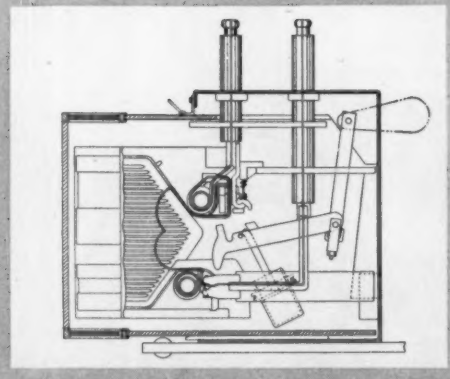
GENERAL ELECTRIC



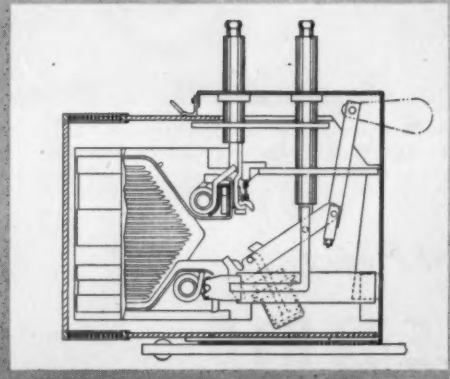
½ At approximately ½ cycle, breaker is closed. Red line shows current path through contacts.



1 At one cycle, breaker is operating. Contacts have parted, arc is drawn.



1½ At one and one-half cycles, arc has been forced into arc chute for interruption.



2 At two cycles, arc has been extinguished, and complete circuit interruption has occurred.

INTERRUPTS FAULTS IN ONLY 2 CYCLES

General Electric Announces Industry's First 2-cycle, 13.8-kv Metal-clad

Fault interruption in only two cycles is now possible with General Electric's new line of 13.8-kv Metal-clad Switchgear.

This new 2-cycle equipment is specifically designed to meet electric utilities' need for faster interruption and increased system protection.

Electric utilities using General Electric's new 2-cycle, 13.8-kv breaker can get:

- reduced line burning
- better protection against conductor annealing during faults, and
- better co-ordination with other distribution protective devices.

These same benefits are also provided by new companion 2-cycle, 4.16-kv Metal-clad Switchgear.

Contact your nearest G-E Apparatus Sales Office for more information on the new line of 2-cycle circuit breakers. General Electric Co., Schenectady, New York.

511-30

Progress Is Our Most Important Product

GENERAL ELECTRIC

R&IE Recloser Adds Adjustable Pickup, Trips

The type MB-2, 15-kv automatic circuit recloser has additional features, advises the manufacturer, R&IE Div. of I-T-E Circuit Breaker Co, Greensburg, Pa.

One improvement is the provision for adjustable minimum pickup between the limits of 180 deg and 250 deg for any rating, also for any voltage application between the limits of 2.5 kv and 14.4 kv. This is reported to provide better protection and faster operation on longer distribution lines.

Another new feature is the addition of two-instantaneous trips to the many operating sequences now available.

A new rating and attachment will be announced in a forthcoming issue of Electrical World.

Derrick, Winch and Digger Controlled by Switch Head

Hydraulic pole line truck equipmen—derrick, winch and digger—operated entirely by remote control has been developed by Tel-E-Lect Products, Inc, Minneapolis.

E. T. Michaelson, sales manager, said that recent field tests of the equipment have proved simplified controls permit even totally inexperienced men to reach full production capacity after 10 min instruction.

A hydraulic control panel is mounted inside the truck's cabinet wall. By moving small toggle switches on the hand-held control head, the operator has full control of derrick erecting, up and down movement; digger forward and reverse action; all winch line operations; truck engine speed and derrick storage.

American Standards Published or in Process

American Standards Association, New York, reports the status of the following American Standards:

Published—Definition of Electrical Terms, Transportation: General, C42.40—1956; Air, C42.41—1956;

(*Continued on page* 86)

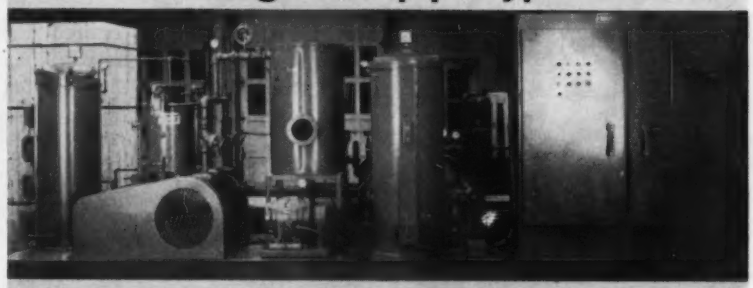
New I-60 meters Certified!

This seal of certification on General Electric's new I-60 Class 200 watthour meters means they've passed rigid quality control tests for accuracy and performance. Your G-E salesman will show you how this pre-testing can save you time and money.

628-13

GENERAL ELECTRIC

COMMONWEALTH EDISON chooses CFC PURIVAC to purify insulating oil for underground pipe-type cables

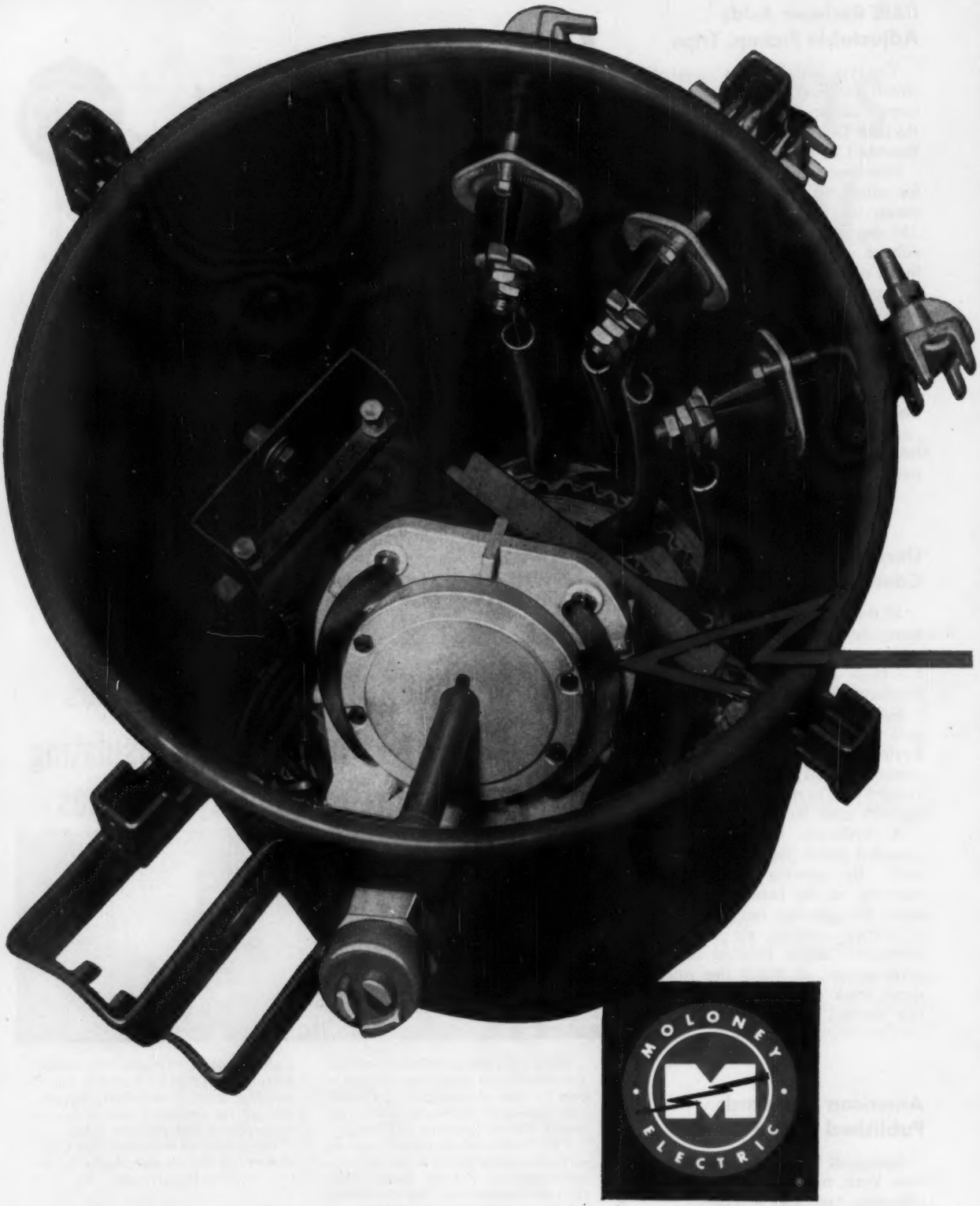


The CFC Purivac maintains critical specifications of insulating oil used in over 15 miles of underground 138,000 volt pipe-type cables by Commonwealth Edison Company of Chicago.

CFC Purivac filters, dehydrates and degasifies insulating oil in one continuous operation. Purivac meets these rigid requirements of Commonwealth Edison: maximum gas content of 1.0% under standard conditions of 760 m.m. of mercury and Zero C. In addition, moisture content is reduced to only 5 to 15 parts per million, which contributes greatly to the oil's high dielectric strength. All foreign matter is removed by Purivac's multi-cartridge filter. Result: clean, dry, gas-free oil for unlimited service in the underground high-pressure cable.

For a booklet describing the Commonwealth Edison installation in detail, write to Department EW.

COMMERCIAL FILTERS CORPORATION
Melrose 76, Massachusetts
Plants in Melrose, Mass. and Lebanon, Ind.


MOLONEY
ELECTRIC

INTRODUCING . . .

MOLONEY S-M (Series-Multiple) DISTRIBUTION TRANSFORMERS

Many utilities having in mind future load growth which will necessitate the use of higher distribution system voltage, are installing transformers having series-multiple high voltage windings. These transformers are initially used on the multiple connection and later changed to the series connection when the distribution voltage is raised.

The use of series-multiple transformers eliminates the need for changing out transformers and thereby reduces cutover time. To further reduce cutover time Moloney is offering transformers equipped with an *externally operable* series-multiple switch making it unnecessary to open the tank and change terminal board links.

MOLONEY S-M

Distribution Transformers equipped with this series-multiple switch are available in standard sizes from 5 to 167 KVA and with any of the following high voltage ratings: 2400/4160Y x 4800/8320Y, 2400/4160Y x 7200/12470Y, 4800/8320Y x 14400/24940 Grd. Y., 7200/12470Y x 14400/24940 Grd. Y.

1. Operation of the switch is extremely simple, it is only necessary to unscrew the cap, turn the cap over, insert it on the operating shaft and rotate the switch to the proper position. Provision is made to clearly indicate the switch position. The cap provides a weather-proof, pressure-tight seal.

2. The switch is mounted on the tank wall rather than on the core-and-coil unit thereby eliminating any shaft alignment difficulties. The switch shaft is brought out of the tank above the oil level.

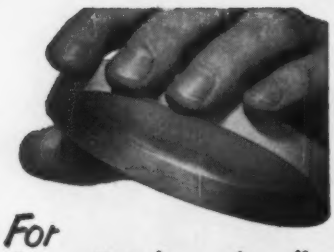
3. Contact blades are made of beryllium copper. The switch body is of wet-process porcelain.

For additional information contact your nearest Moloney Sales Office. MXSS-1

M O L O N E Y E L E C T R I C C O M P A N Y

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



For "small-job sealing"...

Johns-Manville

Duxseal

in the new handy pocket roll

THE NEW HANDY pocket roll makes Duxseal® ideal for small sealing jobs in both installation and maintenance work. It thereby increases the usefulness of your favorite all-purpose sealing and caulking compound.

The NEW pocket roll container allows quick removal and replacement of the compound. Its ribbon form makes Duxseal easy to apply in any amount, large or small.

3 types of Duxseal are now available in pocket rolls:

- **STANDARD DUXSEAL** is a permanently plastic gray-green compound utilizing a non-drying, vegetable-oil vehicle. It will not corrode metals, plastics, wood, rubber, or painted surfaces. It adheres well to all common materials. It is non-staining.
- **TYPE N DUXSEAL** has the same properties plus higher resistance to bleeding or dripping at high temperatures.
- **R-100 DUXSEAL** employs a resinous material as its vehicle and has the same properties. It skins fast to provide an excellent paint surface.

A wide range of other J-M Sealing Compounds is also available in pocket rolls. These are described in sheet EL-85A. Duxseal is covered in sheet EL-68A. Write Johns-Manville, Box 14, New York 16, N. Y.

Johns-Manville

DUXSEAL

American Standards

(*Continued from page* 83)

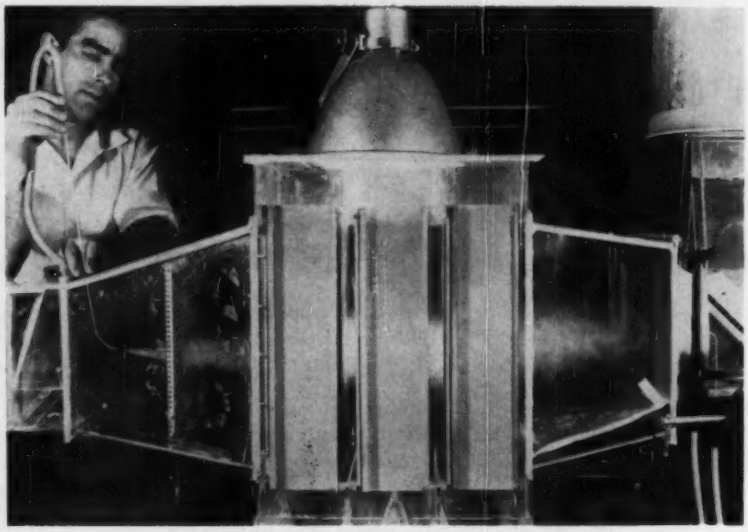
Land, C42.42 — 1956, Marine, C42.43—1956, price $1.40. Also, Requirements for Overhead-Type Distribution Transformers 67,000 Volts and Below, 500 kva and Smaller, C57.12c — 1957, price $2.00.

Approved—Safety Standard for Specialty Transformers, C33.4—1958. Also, Method for Sampling Electrical Insulating Oils, C59.21—1958.

In Standards Board — Dimensional and Electrical Characteristics of Apparatus Bushings (used with Power Circuit Breakers and Outdoor Transformers) C76.1a (supplement and partial revision of C76.1—1943).

Control Corp Expands

Control Corp, a producer of supervisory control and telemetering in Minneapolis, has published an interesting and brief history of its growth —from its occupancy of a single room with a drawing board and a drill press side by side, to its present development of over an acre of floor area. Presented also are the personnel of its application and sales organization. Ask for Letter No. 94.



Precipitator Models Improve Flue Design

Scaled working models of precipitators and their connecting flues are helping Research-Cottrell engineers to improve flue design. By using transparent plastic models they have been able to study gas flow patterns, and obtain velocity and pressure profiles. Smoke, used as the investigating medium, is clearly visible through the plastic. Testing is performed at the company's Bound Brook, N. J. plant.

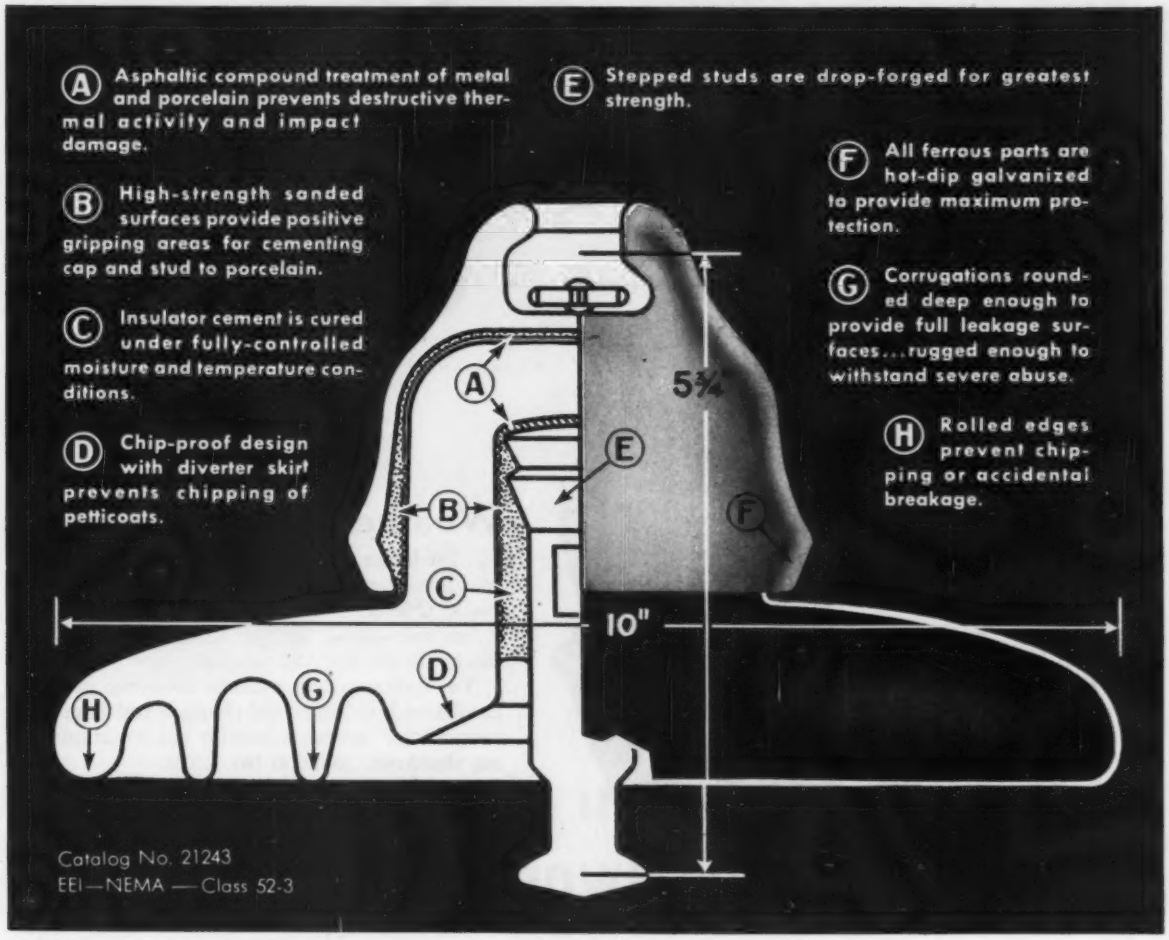
By considering the precipitator and its connecting flues as a unit, Research-Cottrell has been able to obtain a uniform distribution of gas entering the precipitator. Without this approach it has, in the past, sometimes been necessary to design precipitators large enough to make up for turbulent flow of gas into the precipitators.

Specifically the model studies show that savings can be accomplished by: Decreasing the pressure drop, increasing capacity of precipitator, saving in its design, and lowering construction costs.

Model shown includes heater (left), inlet flue, precipitator, and outlet flue to stack. The models cost about 1 to 2% of the cost of the precipitator. Research-Cottrell engineers hope that future studies with the precipitators will enable them to reduce precipitator size 10 to 20%.

Custom-Built Thomas Insulators meet severest requirements

CHECK THESE FEATURES


(A) Asphaltic compound treatment of metal and porcelain prevents destructive thermal activity and impact damage.
(B) High-strength sanded surfaces provide positive gripping areas for cementing cap and stud to porcelain.
(C) Insulator cement is cured under fully-controlled moisture and temperature conditions.
(D) Chip-proof design with diverter skirt prevents chipping of petticoats.
(E) Stepped studs are drop-forged for greatest strength.
(F) All ferrous parts are hot-dip galvanized to provide maximum protection.
(G) Corrugations rounded deep enough to provide full leakage surfaces...rugged enough to withstand severe abuse.
(H) Rolled edges prevent chipping or accidental breakage.
5¾
10"
Catalog No. 21243
EEI—NEMA — Class 52-3

Wherever service conditions make the severest demands on insulators, a Thomas Insulator always gives complete assurance of satisfactory performance. That is particularly true of the insulator illustrated. It is designed and custom-built for installations where physical ruggedness is as important as insulating effectiveness. It fully meets all standard requirements for insulators of its type and capacity. It embodies all the tested refinements of construction and design which assure longer service life and superior performance. For free data sheet, write *Thomas Works, Delta-Star Electric Division, H. K. Porter Company, Inc., Lisbon, Ohio. District offices in principal cities.*

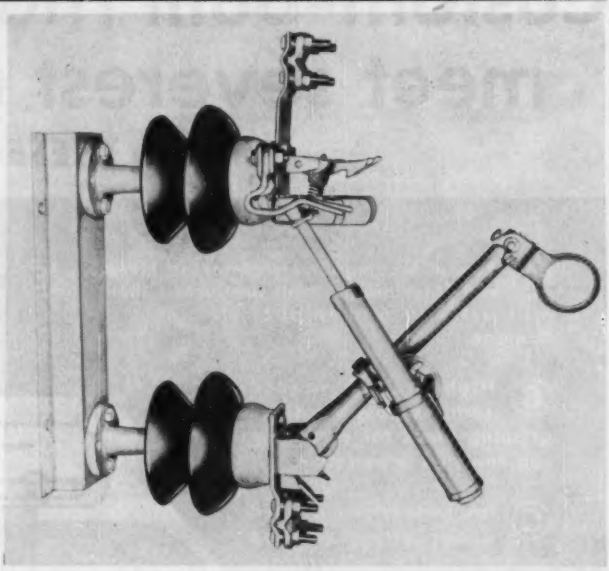
H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, H. K. Porter Company (Canada) Ltd.

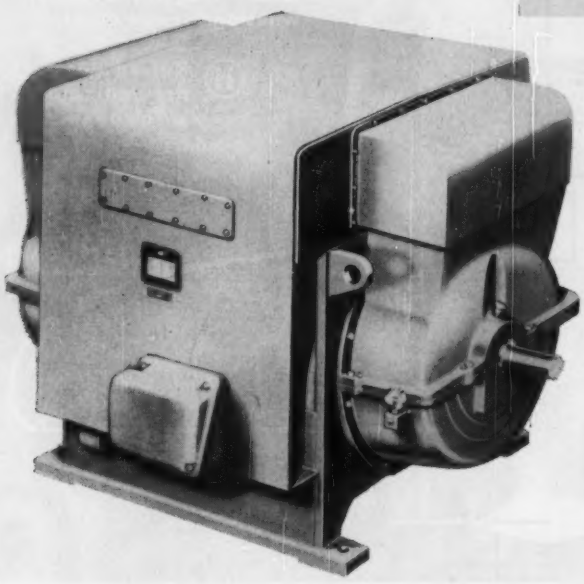
New Equipment

Expulsion Load Interrupter...



. . . rated 600 amp at 15 kv can be used on hookstick operated or horizontal break switches in 7.5- or 15-kv systems. Switches with these Type PLA units interrupt magnetizing and load currents with arcing times of 1.5 cycles or less.

Arc is drawn out in confined space between fiber contact-follower and acrylic tube. Internal actuating spring makes contact separation speed independent of switch speed. Recocking near end of opening cycle eliminates movement of internal contacts during closing. Units may be removed while switches are closed and energized.
Line Material Industries, Milwaukee, Wis.

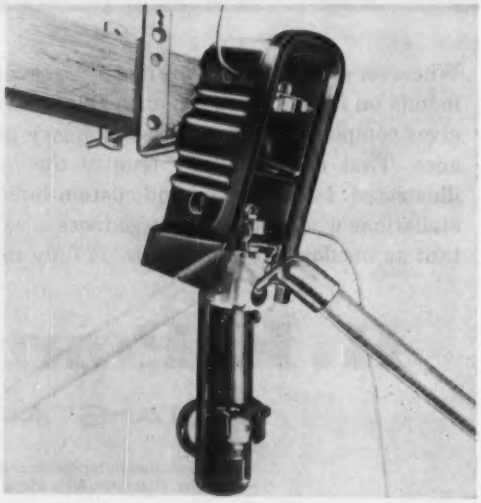


Weather-Protected Motor...

. . . for boiler feed pumps and other outdoor applications can be used in extreme weather conditions. Offered in ratings from 250 to 1,500 hp, it has split-sleeve bearings and brackets for on-the-job inspection and removal.

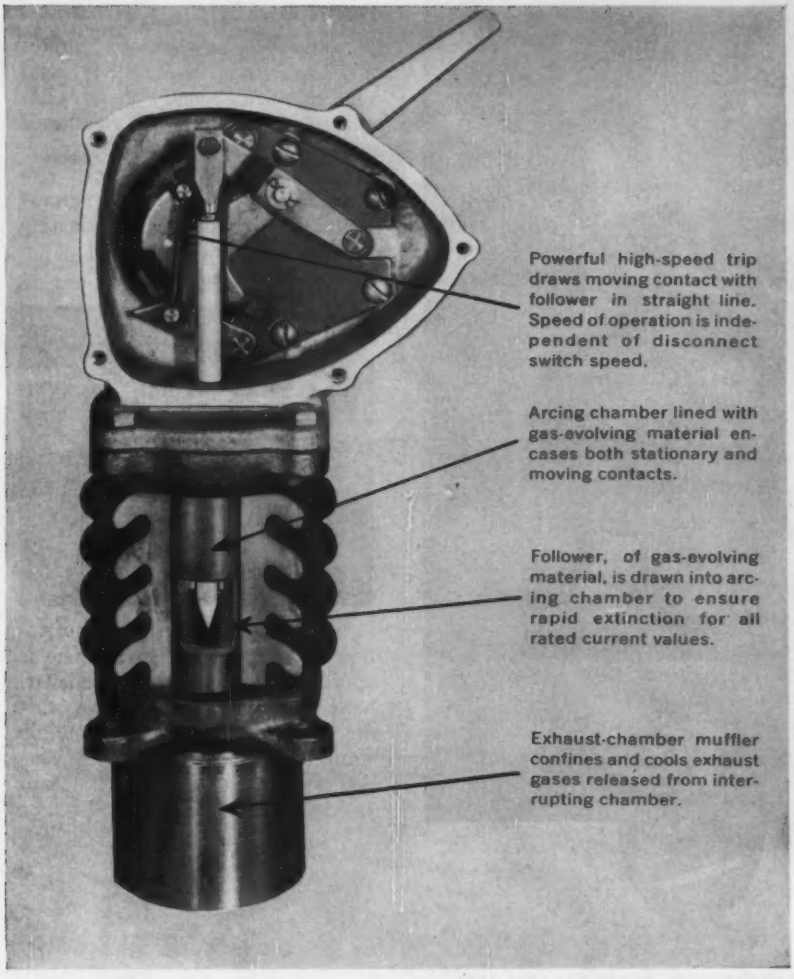
Ventilation system excludes air-borne particles. Insulation is moisture and chemical resistant. Low temperature heaters minimize condensation during shutdown. Bulletin No. 2550.
Louis Allis Co, Dept P, 427 E. Stewart St, Milwaukee 1, Wis.

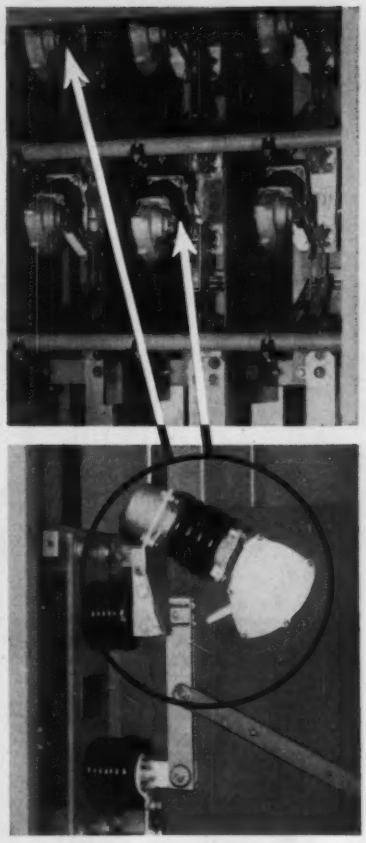
Porcelain-Enclosed Cutout...



. . . permits door installation or removal from any angle with standard hookstick. Interrupting capacity of Type E ranges from 2,000 to 10,000 amp. Fuse operation is shown by indicator flag or 180-deg drop-out action. It is available for 5.2- and 7.8-kv use in 50 and 100-amp cutout models and 100 and 200-amp disconnecting-cutouts. Changing doors converts unit to higher capacity. 50-amp terminals take No. 8 solid to No. 2/0 stranded or No. 1/0 ACSR; 100-amp terminals, No. 6 solid to No. 3/0 stranded or No. 2/0 ACSR.
A. B. Chance Co, Centralia, Mo.

(*More New Equipment on page* 90)


Powerful high-speed trip draws moving contact with follower in straight line. Speed of operation is independent of disconnect switch speed.
Arcing chamber lined with gas-evolving material encases both stationary and moving contacts.
Follower, of gas-evolving material, is drawn into arcing chamber to ensure rapid extinction for all rated current values.
Exhaust-chamber muffler confines and cools exhaust gases released from interrupting chamber.



A typical installation—two Delta-Star 3-pole, indoor group-operated disconnects equipped with POWERUPTER SWITCHES installed in a metal-enclosed cubicle.

Break rated loads instantly and safely with DELTA-STAR POWERUPTER SWITCHES

No external arc; ideal for cubicles and unit substations

Here is an unusually safe, positive interrupting switch, ideal for use in small enclosed spaces where safety is vital. With the Delta-Star POWERUPTER SWITCH there is *no external arc*, no danger of phase-to-phase or phase-to-ground faults. Therefore, men and equipment are safe even if the unit is inadvertently operated.

Indoor POWERUPTER SWITCHES are available in combination with fuses. Ratings from 7.5kv through 34.5kv, with 600-amp. interrupting capacity; continuous current ratings of 400, 600, 1200, and 2000 amperes. For complete information, call your nearest Delta-Star representative or write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Illinois. District offices in principal cities.*

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, H. K. Porter Company (Canada) Ltd.

The battery 'engineered for control'
...25-year life...low maintenance

C & D PlastiCal®

What will be happening when the 1980's roll around? The only thing you can be reasonably sure of is that the C & D *PlastiCal®* Control Batteries you install today . . . *will not require replacement until then.*

Twenty-five-year life? Yes! C & D "Control" Batteries are not only designed specifically for control, switchgear, and auxiliary power applications—they're engineered to last a quarter of a century. Users even boast that these advanced lead-calcium plate batteries only have to be watered about *once a year.*

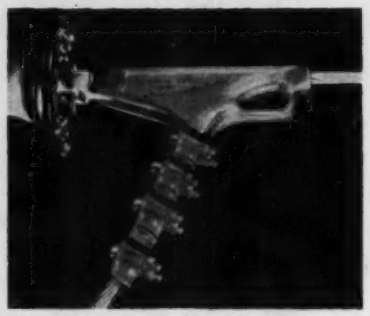
For ample, dependable battery power *instantly* when you need it, it pays to specify C & D *PlastiCal.* It pays . . . in the long run, too.

For details, send for Bulletin CP-536

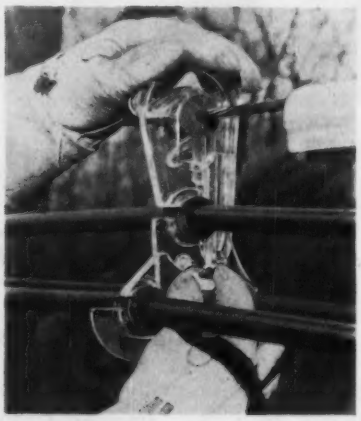
C&D **BATTERIES, INC.**
of Conshohocken, Pa. ... Attica, Ind.
SINCE 1906
SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

Dead End Strain Clamp . . .

. . . for transmission use features non-corrosive aluminum body and keepers which obviate ribbons or liners. Flared mouth at cable entrance protects conductor against chafing. Supplied with clevis or socket eye fitting, this Type SD clamp permits continuous conductor, eliminating troublesome jumper connections on compression dead ends.



Wide range of sizes allows selection of clamp with groove diameter approaching conductor diameter. Nose extension permits stable seating at cable entrance into hot line strain carriers.
Anderson Electric Co, Birmingham 1, Ala.



Cable System . . .

. . . using molded plastic clamps requires only 1-ft clearance through trees. System is for 5-kv cables for 2400/4160Y and 4800-v delta systems; 8-kv cables for 4800/8320Y and 7200-v delta. System has immediate phase identification. System may be reinforced without removing the clamps from messenger.

The Roeclamp is spaced approximately every 30 ft. Conductors and

(*Continued on page* 94)

Keeping Pace with Your Progress...

CHESTER

plasticord®
plasticote®

WIRES & CABLES

A complete line of quality wires and cables including—

- ALARM AND SIGNAL WIRE
- ARMORED BUSHED CABLE
- COAXIAL CABLE
- CUSTOM CABLE CONSTRUCTIONS
- FLAME RETARDANT HIGH VOLTAGE WIRE
- FLEXIBLE CONDUIT

- HIGH FREQUENCY LEAD WIRE
- INTERCOM, CONTROL AND AUDIO CABLE
- NON-METALLIC SHEATHED CABLE
- TELEPHONE BRIDLE WIRE
- TELEPHONE CABLE
- TELEPHONE INSIDE WIRE
- TRANSFORMER LEAD WIRE
- SWITCHBOARD WIRE
- UF NON-METALLIC SHEATHED CABLE
- WEATHERPROOF WIRE

Expanded plant facilities assure fast service on famous-for-quality Chester wires and cables

The new ultra-modern Chester Cable Corporation plant is now in full production on super-rugged extra-pliable Plasticote and Plasticord wires and cables. These longer-lasting Chester conductors, plus nylon coated and teflon wrapped wires are available in standard types to meet every wiring requirement. When specifications indicate the use of custom constructions, they can be produced to your special design. The Chester engineering staff, and research facilities, are available to help solve unusual wiring problems.

Pioneer Producers of Plastic Insulated Wires and Cables since 1940

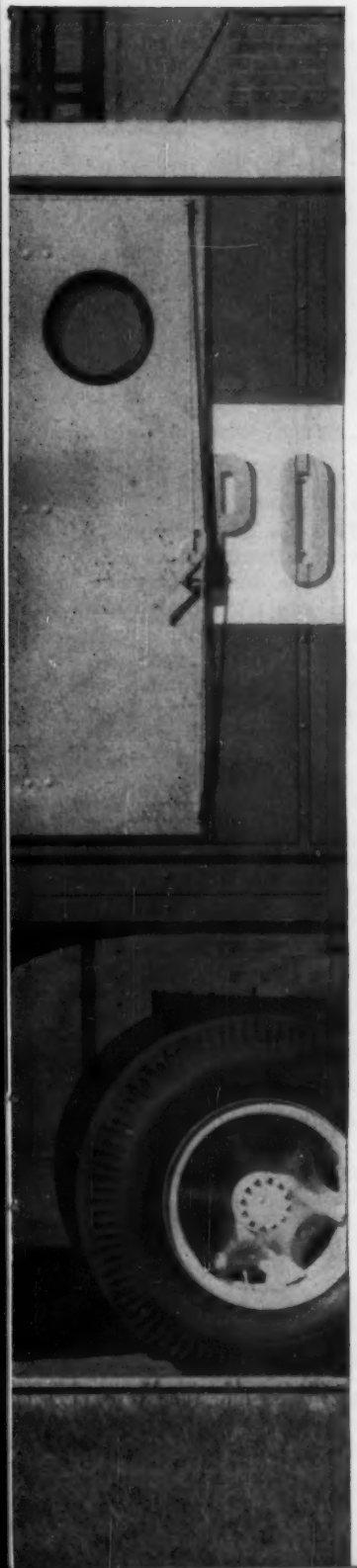
CHESTER CABLE CORP.®

A Subsidiary of Miami Copper Company

45 HILL STREET, CHESTER, N. Y.

Built only to

produce electric power



The Diesel engine was first designed and built for mechanical drive. It was much later that Electro-Motive incorporated this principle in designing and building a prime mover specifically for electric power generation.

It was, in fact, in 1932 that two experimental electric power generating sets were tested at the Chicago Century of Progress Exposition. These two cycle engines were a revelation in design —compact and lightweight.

Refined and improved over the years, this advanced prime mover has been produced in quantity by Electro-Motive—enough, in fact, for a total generating capacity of more than 24,000,000 kw. Above all, this engine has proved its dependability, operating for thousands of hours under every conceivable condition with only the most routine type of servicing.

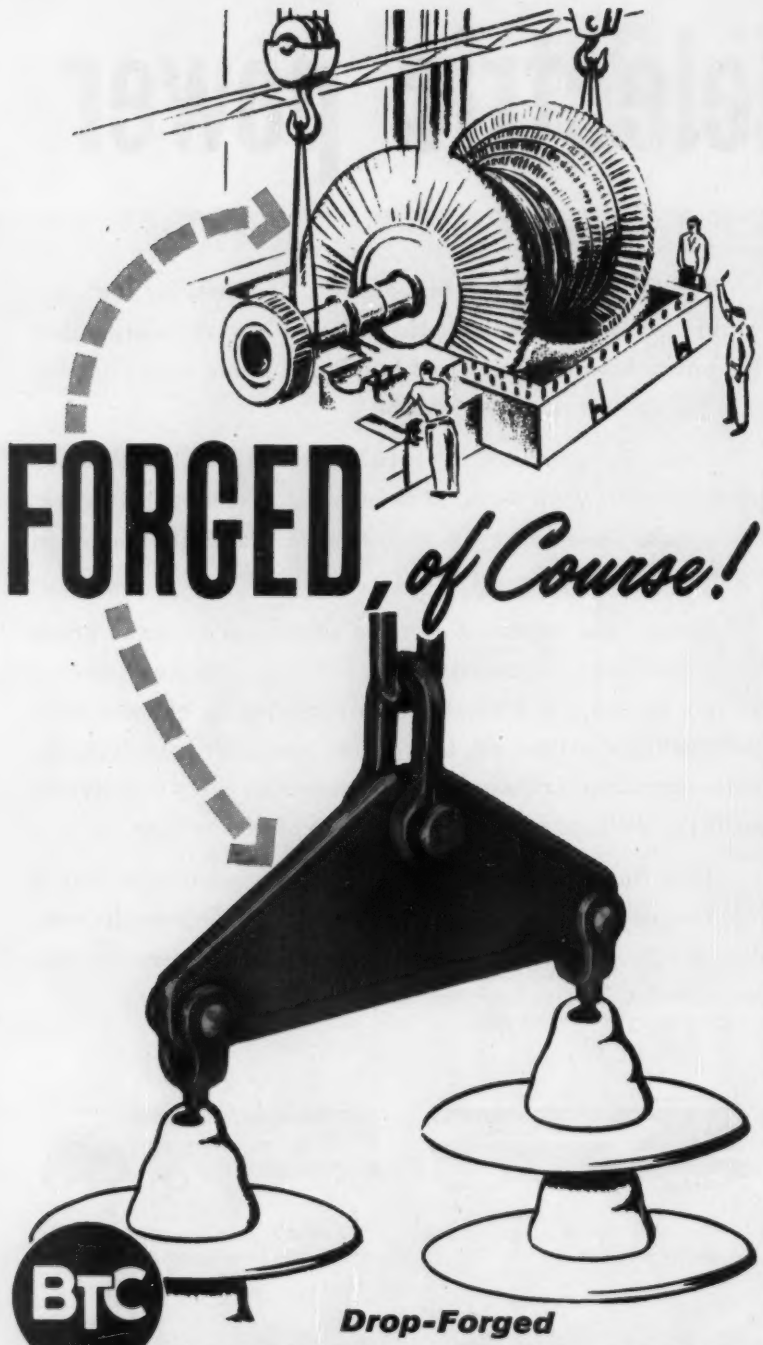
It is this wealth of tested and proven experience that is your best assurance when you install Electro-Mobile equipment. Why not discuss its potential for low load factor generation with your Electro-Motive representative?

1000 kw units for use on sidings or placed on piers for semi-permanent use.

500 kw units offer excellent mobility for many temporary applications.

LIVE BETTER ELECTRICALLY

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
LA GRANGE, ILLINOIS
Sales offices in Chicago, New York, St. Louis, San Francisco
In Canada: General Motors Diesel Limited, London, Ontario



Drop-Forged
STRAIN YOKE SETS

Superior resistance to shock and fatigue
Forged plates with full radius (corona free) edge
Specify the best—BTC Hi-Line Hardware

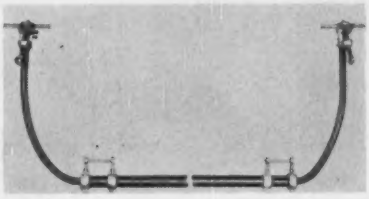
THE BREWER-TITCHENER CORPORATION
HI-LINE HARDWARE DIVISION • CORTLAND, N.Y.

Cable Systems . . .

(*Continued from page* 90)

messenger are held in place in the clamp. Air space between the conductors gives good heat dissipation. Messenger above the conductors protects them from falling limbs, and gives good lightning protection. Unit type construction makes for easy installation.

John A. Roebling's Sons Corp, Trenton 2, N. J.



Hot-Line Jumper . . .

. . . has Fiberglas reinforced protector sleeve for safer operation and longer jumper life. Jumper may be gripped with wire tongs or lashed to crossarm without abrading insulation. Accidental electrical contacts while handling are prevented by attaching clamps to the stirrups. Long rigid section cuts working area congestion by eliminating cable loop and keeping jumper within three ft of conductor. Made in 12, 14, and 16 ft lengths, the 10-kv cable terminates in aluminum alloy clamps for use on conductors through 636 Mcm.

James R. Kearney Corp, 4236 Clayton Ave, St Louis 10, Mo.

Feeder Voltage Regulators

. . . with step-type design are addition to ML-32 line. These ground-mounted line includes ratings of 125 and 167 kva for 2.5 and 5 kv; 250 kva for 7.26 kv; and 138 kva for 13.8 kv.

Current capacity of existing ML-32 regulators, rated 75 and 100 kva at 2.5 kv, has been boosted to 480 amp or 160% of rated current, whichever is less.

General Electric Co, Schenectady 5, N. Y.

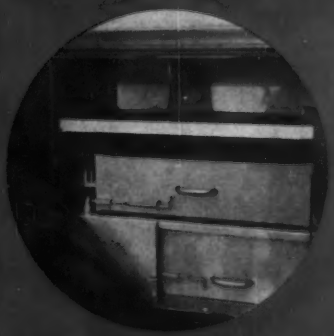
YH

CREATIVE ENGINEERING FOR
THE PUBLIC UTILITY INDUSTRY
SINCE 1892

this is the latest design 20IU76 BODY

Illustrating YORK-HOOVER CONVENIENT SPARE WHEEL SLIDING SHELF. Can also be used for additional tool or material carrying compartment.

Illustrating NEW YORK-HOOVER EXTRUDED NEOPRENE GUIDES for overhead ladder brackets that prevent chafing wear on ladder rails.



Illustrating NEW YORK-HOOVER EXTRUDED NEOPRENE DOOR SEALS —more durable than sponge rubber— also prevents doors freezing to seals in cold weather.

THESE FEATURES MAKE THE YORK-HOOVER 20IU76 SERVICE BODY *THE LATEST*

Yes, these and many more *cost-saving features* including—lightweight, yet rugged construction—adjustable, partitioned drawers—and flush type, paddle handles—make the York-Hoover 20IU76 Service Body the latest in *design —construction*—in overall *efficiency.* Write for complete details today! Make sure *you* have the latest design 20IU76 Service Body—the *York-Hoover* 20IU76.

CLIP AND MAIL TODAY!

Dept. 2E, York-Hoover Corporation
York, Pa.

Please send me a copy of Bulletin No. 937 covering your 20IU76 Service Body.

Name_____

Company_____

Address_____

City and State_____

BODY DIVISION
YORK-HOOVER CORPORATION
YORK, PENNSYLVANIA

Build lines to STAY with the CHANCE 8-WAY!
Give the Guy a CHANCE
This gives you a mole's eye view of what goes on below "see" level when a Chance 8-Way Anchor is dropped into a hole the same size as the base plate and expanded into solid earth all around the hole.
Mike the Mole UNDERGROUND OBSERVER

8-Way Expanding Anchors give you all 'round holding power

Only the Chance 8-Way Expanding Anchor, with its 8 rib-reinforced blades, expands into solid earth *all the way around* to form a pyramid-like square.

This design adds strength to expanding anchors. The pyramid enlarges the effective area of the anchor's holding power. Blades that expand side by side leave no wasted space between them—can be shorter, less apt to bend, and expand in a wide area of solid earth all around the hole.

Make the Chance 8-way *your* standard for the kind of guying you can install and forget. Available from your anchor distributor, in sizes from 60 to 200 sq. in. in area.

. . . and there are CHANCE ANCHORS for all other soil and guying conditions

A·B·CHANCE CO. CENTRALIA MISSOURI

(A·B·CHANCE CO. of Canada, Ltd., Toronto) CA58-3

Books

What Does the Code Mean?

National Electrical Code Handbook, Ninth Edition. Revised by Charles L. Smith. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 664 pages, illustrated. Price $8.00.

The ninth edition, this text explains the intent and meaning of the National Electric Code. It covers all the changes reflected in the 1956 Edition of the Code. Easy to use, it follows the exact number system of the Code.

How Much Does It Cost?

Electrical Construction Cost Manual. By Ralph E. Johnson. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 448 pages, illustrated. Price $10.00.

A complete step-by-step estimating procedure is outlined in this book. It is full of estimating short cuts. The clearly written text is supplemented by numerous charts, tables and drawings.

Material Properties Explained

Principles of the Properties of Materials. By Jacob Porter Frankel. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 221 pages, illustrated. Price $6.00.

This is intended for a college course on the properties of materials. The author has emphasized *properties* rather than *materials.* Instead of discussing steel, copper, etc, he discusses such properties as conductivity, elasticity, and viscosity.

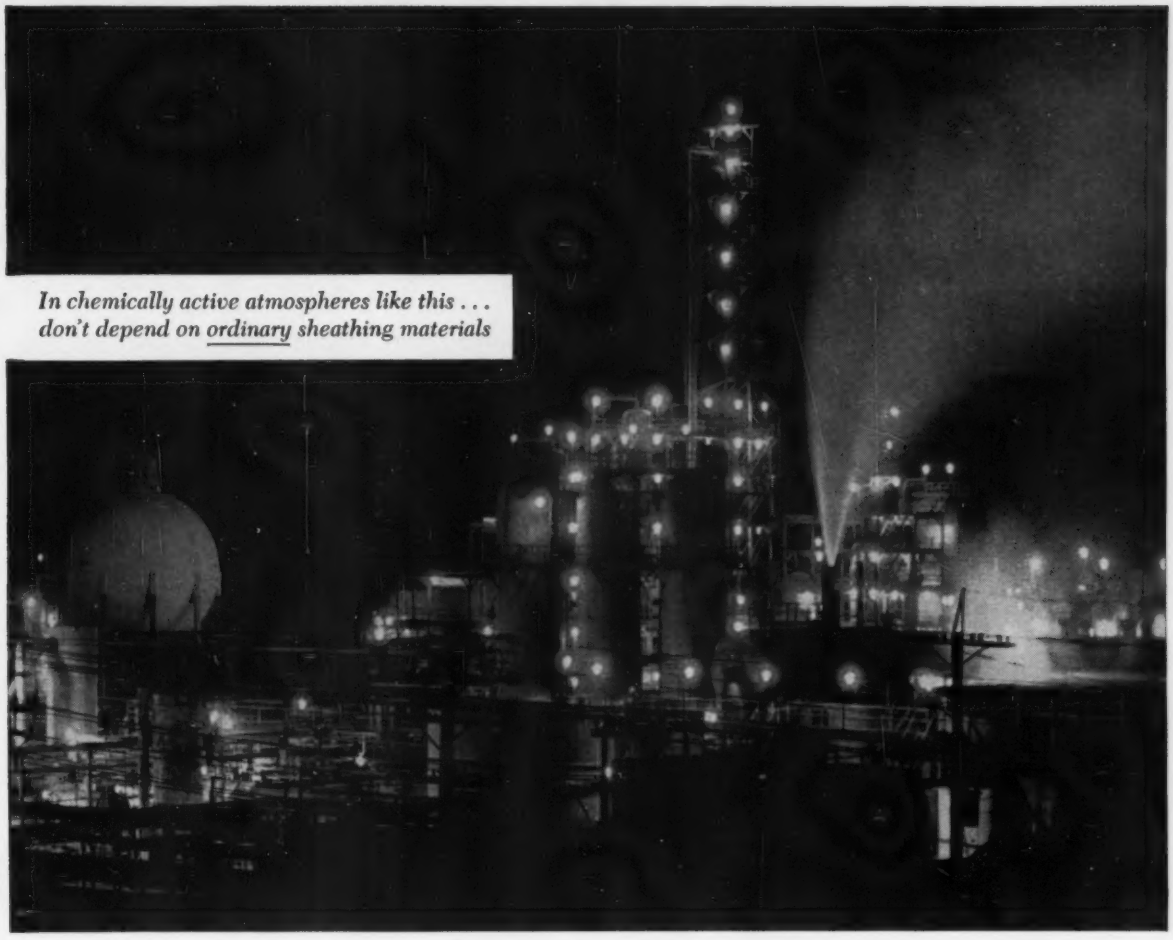
Books Recently Received

Atomic Energy Facts. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price $2.00.

The General Theory of Electrical Machines. By Bernard Adkins. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N. Y. 236 pages, illustrated. Price $8.00.

Production, Transmission and Distribution of Electricity In Europe. Published by The European Productivity Agency of The Organization For European Economic Cooperation, Paris. Price $1.50.

Introduction to Heat Transfer, Third Edition. By Aubrey I. Brown and Salvatore M. Marco. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, N. Y. 316 pages, illustrated. Price $6.75.



In chemically active atmospheres like this . . . don't depend on ordinary sheathing materials

Continuity of power service often demands corrosion-resistant cable sheaths . . . like Roseal

What happens when your power cable in a refinery, steel mill, paper mill, or chemical processing plant fails from the deterioration caused by a highly corrosive atmosphere? You pay to replace the cable, your customer complains about downtime, and most important—*you lose power revenue.*

Now you can avoid power service interruptions in areas like those where the increased likelihood of cable breakdown presents a real problem. A new flame-retardant polyethylene compound—developed by Rome Cable—provides the kind of protective sheath you need in critical areas with oxidizing and corrosive atmospheres.

Tough new sheath

Called *Roseal,* this new sheathing compound makes long, uninterrupted service possible where heat, oils, acids, most chemicals, moisture, and oxidizing and corrosive atmospheres exist. Here's why:

1. Roseal resists oils, moisture, and most chemicals *even better than conventional nonmetallic sheathed cables.*
2. Its moisture-resistant characteristics are superior *to all other types of nonmetallic sheaths.*
3. Its flame retardance meets U/L original horizontal flame-test requirements.

Low-cost dependability

As an added benefit, in addition to its excellent properties, Rome's Roseal generally costs less than thermosetting sheaths. Roseal-sheathed cables are available with either aluminum or copper conductors and many types of insulations, including Rome's ozone-resistant oil-base (Rozone) or butyl-base (Rozone A) insulations. You can get single-conductor Roseal-sheathed cables in a variety of sizes from No. 8 AWG to 1,000 MCM, with grounded or ungrounded neutral, in standard voltage ranges from 3 to 15 KV.

For more information, contact your nearest Rome Cable representative—or write to Department 718, Rome Cable Corporation, Rome, New York.

FREE: New Technical Bulletin—describing in detail Rome's shielded high-voltage power cables—sheathed with thermoplastic Roseal—is now available. Just write for Bulletin RCD-700.

ROME CABLE
CORPORATION

Teachers Probe Appliances on Tour

Home economics teachers in the Chicago area were treated to a tour of the latest appliance exhibits at the Merchandise Mart recently by the Chicago Electric Association. Some 240 public and catholic school teachers made the rounds.

Shown above, Sisters Mary Renee and Mary Pierre of Mundelein College get the story on an oven thermometer from Commonwealth Edison's H. L. L'Hommedieu, center, as Chicago Electric Association managing director C. C. Simpson looks on.

Exhibitors plan to make their facilities available to home economics teachers who wish to bring their classes to the Mart for instruction.

WP&L Lines Up Promotion on Humidity Control

Wisconsin Power & Light Co is now promoting humidity control summer air conditioning, as well as year-round climate control. WP&L thinks it's the first time any company has pushed humidity control as a special item.

The Wisconsin utility's basic reasoning: Humidity control air conditioning is usable by customers almost the entire summer, whereas air cooling alone is good for only about 600 hrs. Also, the company figures it can "break even" on present rates.

One interesting feature of the WP&L coming promotion is the inclusion of humidity control air conditioning and electric heating in its Gold Medallion Homes program. Another is the installation of HCAC in company offices and stores. Special pushes are being aimed at distributors and dealers.

In a bulletin to air conditioning equipment manufacturers, WP&L has asked them for information on humidity control equipment when they begin marketing it.

'USEPOWER' is Featured in New NWB Kit

National Wiring Bureau's new commercial wiring "How To" kit features a concept called "Usepower". It is, in effect, the commercial counterpart of the residential wiring market's "Housepower."

The new kit was introduced at the 13th Annual National Wiring Sales Conference held in Detroit on February 20-21. It offers a step-by-step approach to the reported $22½ billion market in wiring and electrical service equipment during the next ten years, to wit:

- How to sell Usepower.
- How to use Powerating sheets.
- How to find prospects and size up their needs, including a Directory of Appliances that lists equipments and their demands.
- How to order effective and inexpensive promotion materials.

Order sample copies of the kit from National Wiring Bureau, 155 E. 44th Street, New York 17, N. Y.

NEES Sales Campaign

New England Electric System's recently completed Golden Jubilee Sales Campaign chalked up 992 ranges, 359 water heaters, 1,312 dryers, 1,761 automatic washers, 113 dishwashers, 1,694 electric blankets, and 49 calcinators. Weymouth Light & Power Co topped all sales districts, selling 156.8% of its assigned quota. The Merrimack-Essex Northampton and Suburban Electric subsidiaries of NEES attained respectively 136, 135 and 125% of their objectives. Vp Claude D. Lawrence of New England Power Service Co headed the campaign.

Farm Safety Film

A film stressing the value of proper wiring and other farm electrical installations in terms of safety and power use is now available.

Based on suggestions from electrical experts, it covers proper installations on the farm for maximum safety and most efficient use of power, grounding, wire size, fusing, lighting protection, proper use and care of electrical equipment.

Price: $150.00. Order from Film Productions Co, 4510 Excelsior Blvd, Minneapolis 16, Minn. Preview arrangements on request.

(*More Selling on p* 100)

Utility crews work safer, more efficiently with M-S-A® Lineman's Suits and Gloves

M-S-A LINEMAN'S SUITS keep crews safe and snug in foulest weather. Day-in, day-out resistance of these suits to abrasive wear and tear, is easy on maintenance dollars. Tension points are reinforced for long life. Full cut allows freedom of movement. Guaranteed completely waterproof, these suits are easy to clean, have non-conductive molded nylon buttons (no metal). Available in high visibility Yellow, Hunter's Green or Black. And in Heavy Weight or Medium Weight Neoprene Latex on cotton or nylon fabric. Also, in Vinyl on nylon.

M-S-A LINEMAN'S GLOVES pass on the same safety/comfort benefits. They're strong and durable—possess high dielectric strength—tested to required voltage.

The MSA man will be happy to give you details on these hard-working items. Or, write us for descriptive bulletin for further information.

MSA SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES COMPANY, Pittsburgh 8, Pennsylvania

Used to salvage sulphates from paper plant flue gases . . .

Precipitators Save $3,000

Four double chamber precipitators used to recover salt cake and prevent air pollution are paying off to the tune of $3,360 per day at the St Regis Paper Co in Jacksonville, Florida. Flue gases from the black liquor recovery boilers are passed through the units to salvage the minute particles of sodium sulphate and sodium carbonate that are formed as the gases cool. In all, a total of 112 tons of cake, valued at $30 per ton, are saved daily.

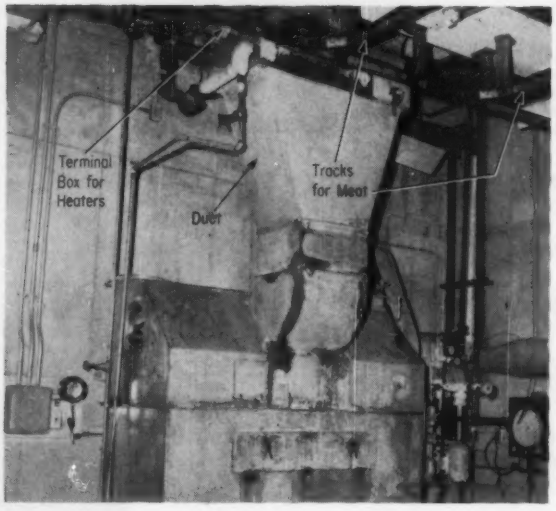
The alkalies recovered from the spent black liquor are reused to digest new loads of wood pulp in the paper-making process. In addition, the rigid air pollution requirements of the nearby municipal airport make it essential that the flue gases be as clean as possible.

Two of the units, with a capacity of 32 tons per day, have been in operation for some time. Two new units, added in a recent plant expansion, account for the other 80 tons of salt recovery. According to engineers in the Metal Products Div of Koppers Co, Inc, who designed the units, the installation is the world's largest in relation to tonnage of pulp produced.

Any three of the four pairs can handle the total load leaving the fourth as a spare in case one of the other units requires servicing.

Each chamber of the new units comprises three consecutive fields, a "field" being a section of gas passages or ducts bounded by flat steel collecting electrodes 16 ft high. Served at 440 v, the rectifiers have a 65,000-v RMS output. Inlet, center, and outlet fields have separate power supplies of 37.5-kva capacity each. Thus the center and outlet fields, where the dust loading is lower because of cleaning in the preceding stages, can be operated at higher voltages, raising the efficiency for the entire unit.

Strip Heaters Provide Low-Cost Week-End Heating



GEORGE H. MAIER, Electric Heating Engineer, Dayton Power & Light Co, Dayton, Ohio

Economical week-end heating plus close, accurate control of temperature and humidity in a critical process area—this is the pay-off from the electric strip heaters that Braun Brothers Packing Co recently installed in their meat processing room. Now the company boilers are completely shut down on week ends. Cost of operating the electric units is considerably lower than the cost of coal and the fireman's labor to run the boiler.

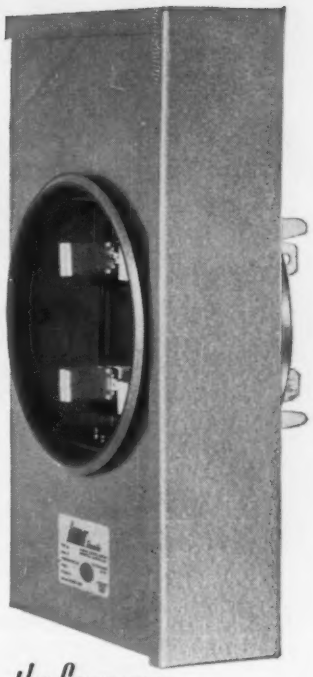
The six sealed strip heaters are installed in the air ducts over the steam coils. Rated 2,450 watts each, they hold room temperature between 67 and 68 F and keep relative humidity in a 87 to 90% range. Units operate from a 240-v line and are controlled by a pneumatic regulator that is also connected to the steam coils. Room dimensions are 18 x 36 x 14-ft high.

NEW... 2 kvar SECONDARY CAPACITOR

provides low cost vars at point of *greatest system benefit*

Here's the answer to utilities looking for a more economical 240 volt secondary power capacitor. The Sangamo Secovar Capacitor installs right at the meter box to relieve the var load all down the line, to cut installation costs, and to conserve valuable pole space.

Installation is simple. No wiring changes are necessary. No special equipment is needed . . . one man can make the installation in a matter of minutes.

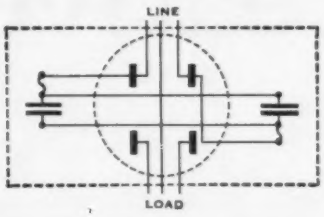


the Sangamo
Secovar Capacitor

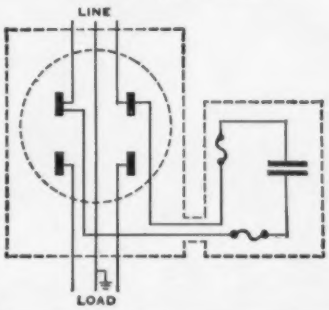
TYPE S for socket mounting

Combines a secondary power capacitor with a convenient socket mounting adapter. Mounts on a standard meter base—either vertically or horizontally. It contains two capacitor sections, each protected against line or ground faults. Available in 2 kvar, 240 volt rating.

WIRING DIAGRAM



WIRING DIAGRAM



TYPE N for adjacent mounting

Comes in a metal enclosure with an adjustable mounting bracket and a nipple connection for installation with standard indoor or outdoor service entrance equipment. Protected against either line or ground faults. Available in 1 kvar, 240 volt rating.

PC58-2

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

creative engineering

(NUCLEAR DIVISION)

Tobe NRG-200 Series Energy-Storage Capacitor

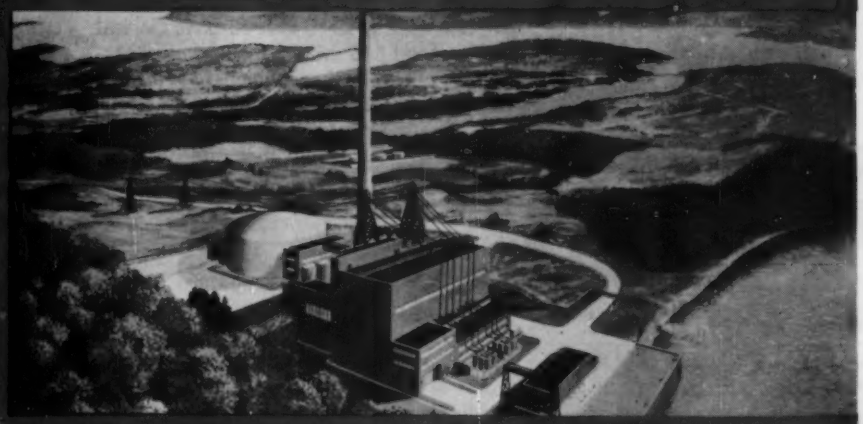
BUILDING CAPACITORS that can develop a peak surge of 20,000 megawatts takes intimate knowledge of capacitor physics and capacitor manufacture. Security regulations prevent our detailing the many projects in which Tobe is pioneering in the exacting area of thermonuclear energy-storage capacitors. (Utility research engineers are now investigating the thermonuclear "pinch" technique as a possible source for continuous electric power.)

Tobe 50 KVAR Power Capacitor

It was Tobe's long experience in building power capacitors that made it possible for us to develop capacitors capable of handling unprecedented peak loads. So, whether you need a bank of 50 KVAR's—or a bank of thermonuclear energy storage capacitors—talk to Tobe.

Tobe Deutschmann Corporation, Norwood, Massachusetts.

in action



THE "FUTURE" IS HERE... in this architect's rendering of the Indian Point, N. Y. nuclear power plant now being erected on the Hudson River 40 miles north of New York, by Consolidated Edison.

TOBE TEMPALL CAPACITORS

Since 1919 persistent research, trustworthy engineering, rigid production standards.

Construction Rises

. . . as nation's utilities budget $5.2 billion for projects in '58, up 10.5%

It will be a big year for electric utility construction departments. Projects already underway or authorized will account for total expenditures of $5.2 billion in 1958. This is a 10.5% gain over the electrical utility construction budget of $4.7 billion last year.

One half of these capital expenditures will go for about 16,600 Mw of new nameplate capacity going on the line in '58. Another 13,700 Mw is scheduled for 1959, and, so far, 1960 additions will total at least 12,100 Mw.

The following roundup gives an idea of some of the utilities' major projects.

Alabama Power Company's 1958 construction budget of $64 million provides for start of construction on Coosa and Warrior river dams. Weiss Dam at Leesburg, the first unit of the multi-dam Coosa River Project, starts in 1958. Site clearing and diversion tunnel drilling for Smith Dam on the Warrior is underway. Dam construction is expected to start this spring. Addition of a ninth Gorgas Steam Plant unit will be completed in 1958. It is costing $23 million. Structure work on a $36 million addition to Barry Steam Plant is nearly complete and erection of steel starts soon, with completion of the addition scheduled for 1959. In addition to funds for generating capacity plants and buildings, Alabama Power expects to spend $25 million on transmission and distribution.

Arizona Public Service Co plans to construct a $2½-million 115-kv line from San Manuel to the Bisbee-Douglas area in southern Arizona starting early in 1958. Begun last year, but to be completed during 1958, was a 230-kv line and substation project in the company's northern division. Also started in 1957 was the $25 million Yucca power plant at Yuma owned jointly by Public Service and California Electric Power Co. The first 80,000-

(*Continued on next page*)

SAVE 40%
4 Wheel Drive
Hubs
WITH
Dualmatic Hubs
Economical Operation!
Only Wheels Move
WITHOUT
Dualmatic Hubs
Costly Operation!
Wheels Move
All Parts Stop
All These Parts
Move
• Stop Front End Wear • Steering Becomes Easier • Makes Tires Last Longer • Cut Costly Repair Bills • Reduce Engine Wear • More Power — Save Gasoline
FLEET COST PRICES
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Willy's Jeeps All Models | J-5 | $47.50
Chev. ½ Ton 3100 Series | C-75 | $49.50
Chev. ¾ & 1 Ton 3600 & 3800 Series | C-85 | $49.50
Dodge Power Wagons Prior 1957 | D-10 | $49.50
Dodge W 100 and W 200 Series | D-95 | $49.50
GMC ½ Ton 100 Series | G-15 | $49.50
GMC ¾ Ton 150 Series | G-20 | $49.50
IHC A & S 120 Series | I-25 | $49.50
Save $2.50 per set by ordering 3 sets or $5.00 per set by ordering 6 sets. Only a partial listing shown above. Available for all 4-wheel drives. Catalogues, Folders, Prices on request.
Order from your local Automotive Jobber or write direct to:
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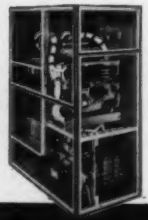


Rectifier Division

SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

Representatives in Principal Cities

"Complete Semiconductor Power Conversion Systems for any AC to DC application"

Construction Rises

(*Continued from page* 103)

kw unit will be in operation in 1959 with Public Service Co's 80,000 kw unit scheduled for service in 1962. Arizona PS plans to spend nearly $30 million for power plants during 1958. This is the first step in a $200 million expansion program over the next five years. Improved electric distribution facilities will cost approximately $13 million.

Appalachian Electric Power Co's budget of almost $50 million for 1958 includes nearly $26 million for completion of its 450,000-kw Clinch River Plant at Carbo, Va. In addition, $4 million is allocated to continue development of the Smith Mountain hydro project and over $6,700,000 for transmission lines and stations, including facilities to be served from Clinch River. Over $11 million has been allocated for distribution lines and stations, including conversion to 66 kv in two districts.

Arkansas Power & Light Co has allocated $17 million for new construction this year. Biggest part has been consigned to distribution improvements that will come to about $10½ million. A three-story office building now underway at Little Rock will cost $2½ million.

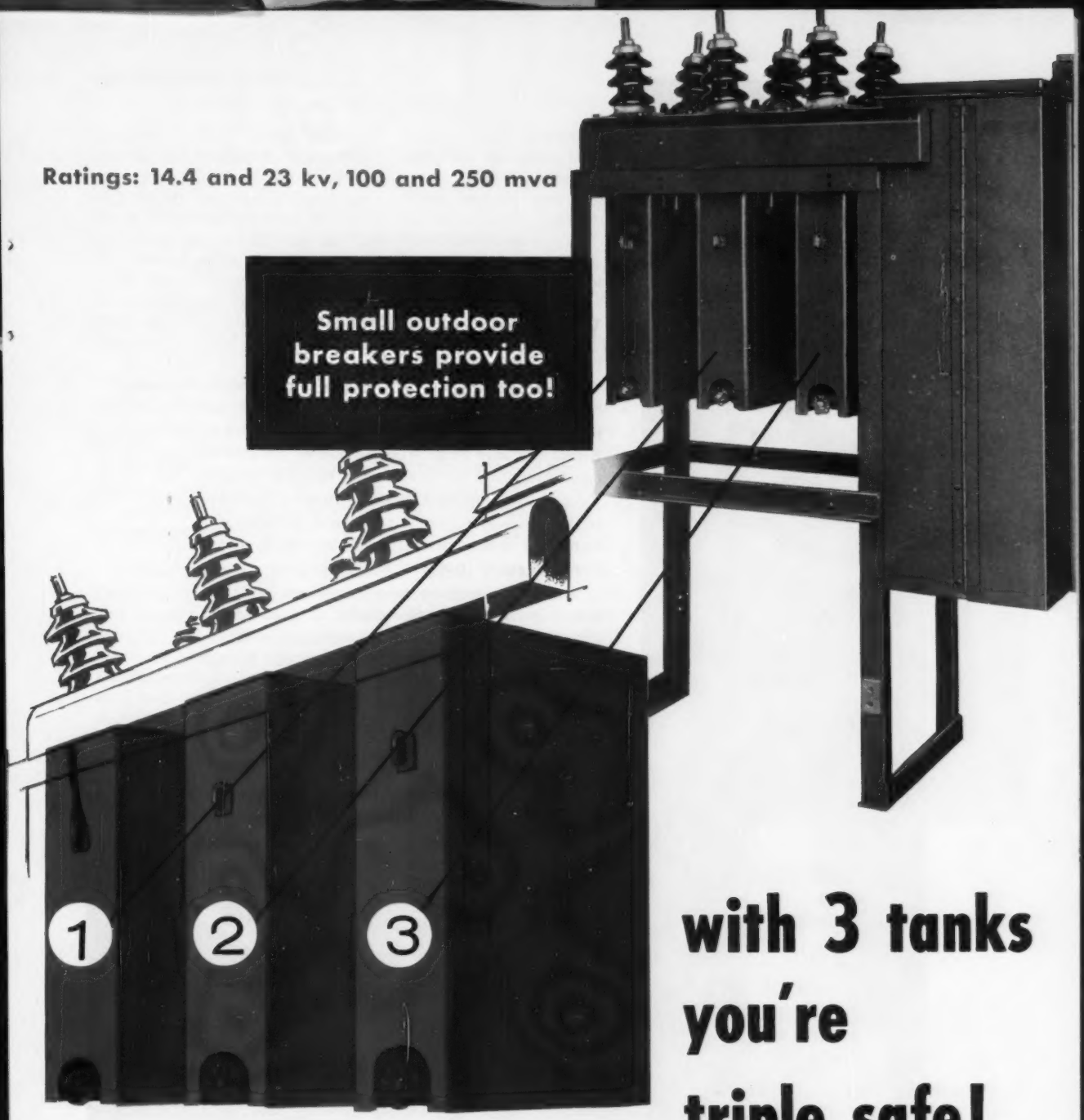
Baltimore Gas & Electric Co will spend $45 million for new construction in 1958 of which $15 million will be spent for new electric generating capacity and associated transmission facilities. Bulk of this amount is for the second generating unit at Herbert A. Wagner Station to be ready for operation early in 1959. Its capacity will be 125,000 kw. The 1958 expenditures include $17 million for electric distribution. Involved are eight new electric substations and expansion of seven existing substations.

Carolina Power & Light Co plans an expansion budget this year of $22,500,000. A big item in the program is completion of a 155,000 kw generating unit at the Cape Fear Steam Station near Moncure.

Consumers Power Co has scheduled investment of $60 million for

(*Continued on page* 107)

Ratings: 14.4 and 23 kv, 100 and 250 mva



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In addition to 3-tank construction, you get many other benefits found in large breakers, such as two interrupting breaks per phase, self-wiping tulip and bayonet contacts, and maximum accessibility to all components.

You can learn more about these 14.4 and 23-kv units — call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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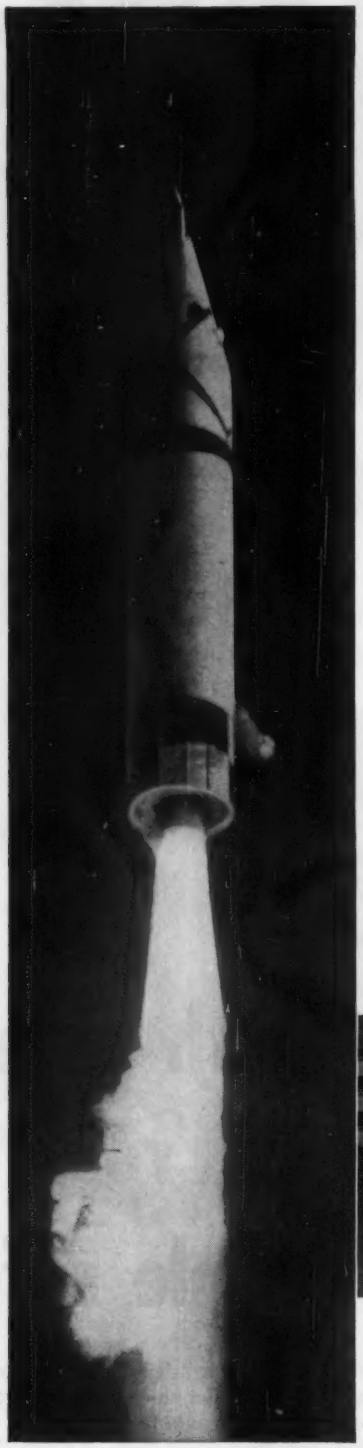
A-5624



When the stakes are high . . .

"Accuracy, reliability and versatility are the major considerations for instrumentation here at Redstone," says Fritz Weber, Chief of the Instrumentation Test Section, Army Ballistic Missile Agency. "During tests that may involve hundreds of thousands of dollars in equipment, supplies and manpower, a failure of the data recording equipment can result in a total loss of the run.

"In our strip chart recording room, we have over a hundred L&N Speedomax G modified adjustable instruments. All are equipped with retransmitting slidewires so that data can be fed into a Millisadic data system for storage and transmission to IBM equipment. Recorders are so equipped that they can be controlled from a central console. There, the operator can select the test site from which data is to be received and the method of data handling to be used. Before a test is started up, all 132 recorders can be standardized by a single button."

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LEEDS NORTHRUP
Instruments Automatic Controls • Furnaces

Construction Rises

(*Continued from page* 104)

projects in 1958. Construction of the 500,000-kw Dan E. Karn Plant, near Bay City, will be continued with the first two units going in service in 1959 and another in 1960. An additional 156,250-kw at Unit No. 8 will go in service early in 1958 at the company's John C. Weadock Plant. Construction will start, too, on a steam station at Port Sheldon on Lake Michigan.

Consumers Public Power District has budgeted an estimated $5,826,540 for new construction in 1958. Of this, upwards of $2 million will go for work on local distribution systems; $1,800,000 for power transmission lines; and $326,000 for revamping rural lines.

Central Hudson Gas & Electric Corp has budgeted $22 million for new construction in 1958. More than $13 million is to be spent for a third unit now under construction at Danskammer Point Station, scheduled to go on the line in late 1959. A half-million dollars will be spent for a 115-kv submarine cable under the Hudson River between Danskammer and Chelsea.

Electric Power Board of Chattanooga will spend approximately $2.2 million in additions and extensions to its distribution system this year. It plans to add approximately 40 miles of 44-kv transmission line during 1958 and about 35,000 kva distribution substation capacity.

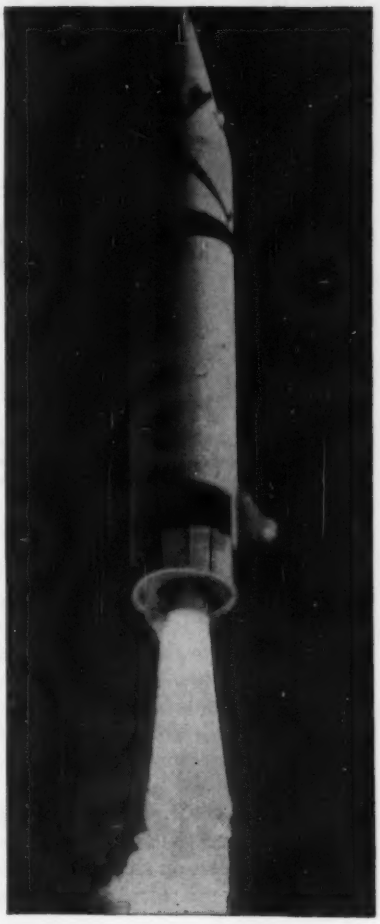
Delaware Power & Light Co's budget is $22 million in 1958. The major item is completion of a second 85,000 kw generating unit now being added to Indian River Station. Other major 1958 items include extension of 138-kv transmission lines from Denton, Md., to the Indian River Plant, an addition to the operation center at Wilmington, and completion of a new service center at Salisbury.

Detroit Edison Co will spend $75 million for capital improvement and expansion in 1958. The largest project is a third generating unit of 320,000-kw capacity at the River Rouge Plant, scheduled for completion this year. Two turbine generators, each capable of producing 260,000 kilowatts, now operate there. Additions to the St. Clair Plant include two more turbine generators with combined capability of 650,000 kw.

Georgia Power Co has allocated $58 million for new facilities in 1958. Larger items on the budget are $5.8 million to complete a 125,000-kw unit at Plant Yates and a 230-kv transmission line to Morrow. Another $8.1 million will go to continue work on Oliver Dam, a 60,000 kw hydro plant on the Chattahoochee River. Work is also going forward on a new steam unit of 75,000 kw at Plant McManus that was begun in 1957.

Idaho Power Co plans to invest some $61,850,000 in 1958 for expansion of its generation and distribution facilities. Bulk of the 1958 allocation will be spent in Hells Canyon. Brownlee Hydro Plant, first of three new dams that will ultimately draw 1,175,000 kw from the Snake River's Hells Canyon stretch, will be completed this year. Oxbow and Hells Canyon dams are the two other structures. Brownlee's four generators will be on the line in 1958. Hells Canyon Dam will follow completion of Oxbow. Idaho Power will also put into operation a 230-kv steel tower line 100-miles long between Brownlee and Boise at a cost of $4½ million. In addition the company's new $4 million Bradley substation will begin 230-kv operation in May 1958.

Illinois Power Co plans a construction program costing $100 million during the next three years. Of this, $54 million has been allocated to five major activities including: $30.5 million for power plants; $4.55 million for additions and replacements of transmission lines; $9.7 million for additions and replacements of electric distribution systems; and $3.75 million for needed new buildings, transportation equipment, and miscellaneous. New generating units scheduled for completion by the end of 1959 and having a capability of 225,000 are under construction at the company's Hennipin Plant.



whether you're working on missiles or megawatts . . .

. . . instrumentation can either enhance — or severely limit — likelihood of success on a given project.

As a utility (or consulting) engineer, you can choose from many load and boiler control systems which stress advanced features. On the other hand, you can choose from systems which stress dependability.

But wherever requirements indicate a need for systems known to be advanced and unquestionably reliable as well, both missiles and "megawatt" engineers specify:

LEEDS & NORTHRUP
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The Year Advertising Helped

This editorial message was first published by McGraw-Hill two years ago. It describes advertising's dramatic contribution to the American economy during 1954. The theme of the editorial—that advertising can help promote economic stability by stimulating sales at a crucial time—is even more pertinent today.

As our economy grows, it is constantly changing. The conditions business faces today are not the same in every respect as those it faced in 1954. But business again has the opportunity, through advertising and other selling efforts, to help sustain a high level of economic activity. At the same time, it will be building markets for the period of renewed expansion that is sure to follow.

This editorial is reprinted exactly as it appeared in 1956 except for minor editorial changes to bring it up to date. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGraw-Hill Publishing Company, Inc.

IN 1954 we had a business recession in the United States. Sales fell about 4% during the year. If management had followed the historic pattern of business ups and downs, advertising volume would have fallen much further.

But in 1954 the volume of advertising did not fall. It increased over 5%, and expenditures in all major advertising media rose. Every effort was made to stimulate sales when sales were needed to sustain prosperity.

This was something entirely new under the sun. It had a powerful influence in making the recession of 1953-54 one of the mildest on record. It helped greatly to speed business on to the record-breaking levels it attained in the years 1955-57.

There are several reasons why America's business management attacked this decline in sales with more advertising. One of them grew out of the greatly strengthened position of the American consuming market. Consumers' income after taxes has been rising an average of over $10 billion a year since 1946, and this rising income is more widely distributed than ever before. Furthermore, consumers had piled up reserves of about $200 billion in cash or its equivalent. These reserves offered a new and powerful inducement to increased selling and advertising effort even in the face of a possible decline in consumer income. (At the end of 1957, consumer reserves were $225 billion.)

Taking the Longer View

However, the principal reason why a sales decline was attacked with increased advertising is management's new-found conviction that good advertising is essentially an investment in the development of a market. Successful development requires sustained investment. The inclination of business management to take this longer view is, of course, motivated

McGraw-Hill PUBLISHING COMPANY,

ABP HEADQUARTERS FOR

Kill a Business Recession

by the fact that the American market, with over 3 million consumers being added annually, is growing at a prodigious rate.

Ten years ago only a handful of companies had plans for investment in new producing facilities extending beyond the current year. Today almost all leading companies have investment programs running some years ahead. And keeping pace with these long-range investment plans has been the development of sales and advertising programs to reach tomorrow's greatly expanded markets.

Advertising's Key Role

This crucial role of advertising in providing driving power for our economy is gaining greater recognition every day. In his book, "People of Plenty," Professor David M. Potter of Yale University remarked: "Advertising is not badly needed in an economy of scarcity, because total demand is usually equal to or in excess of total supply, and every producer can normally sell as much as he produces. It is when potential supply outstrips demand—that is, when abundance prevails—that advertising begins to fulfill a really essential economic function."

Today abundance so completely prevails in the United States that it has been conservatively estimated that as much as a third of everything offered for sale falls in the realm of "optional consumption." That is, consumers can "take it or leave it" without any immediate personal inconvenience. But if they decide to "leave it," a terrific economic depression will not be far behind. In such circumstances, advertising—in which, in all of its forms, we are now investing over $10 billion annually—clearly is of crucial importance to our continued prosperity.

In performing its key role in past years, American advertising never realized its full potential. It successfully promoted sales. But it never was called upon to promote an overall economic stability as a direct outgrowth of increased sales.

By successfully promoting both sales and economic stability, as it did in 1954, advertising surely has added new strength to the American economy. It has also added a great new and constructive dimension to advertising itself.

One of the surest means of expanding your sales volume in today's industrial markets is through dominant advertising in the publications directly serving your major customers and prospects.

McGraw-Hill's business and technical publications can give you quick access to the men who initiate, specify and approve the purchases of industrial products and services. Because all are leaders in their respective fields, you are assured a maximum return on your advertising investment when you *concentrate* in the McGraw-Hill publications serving your most important markets.

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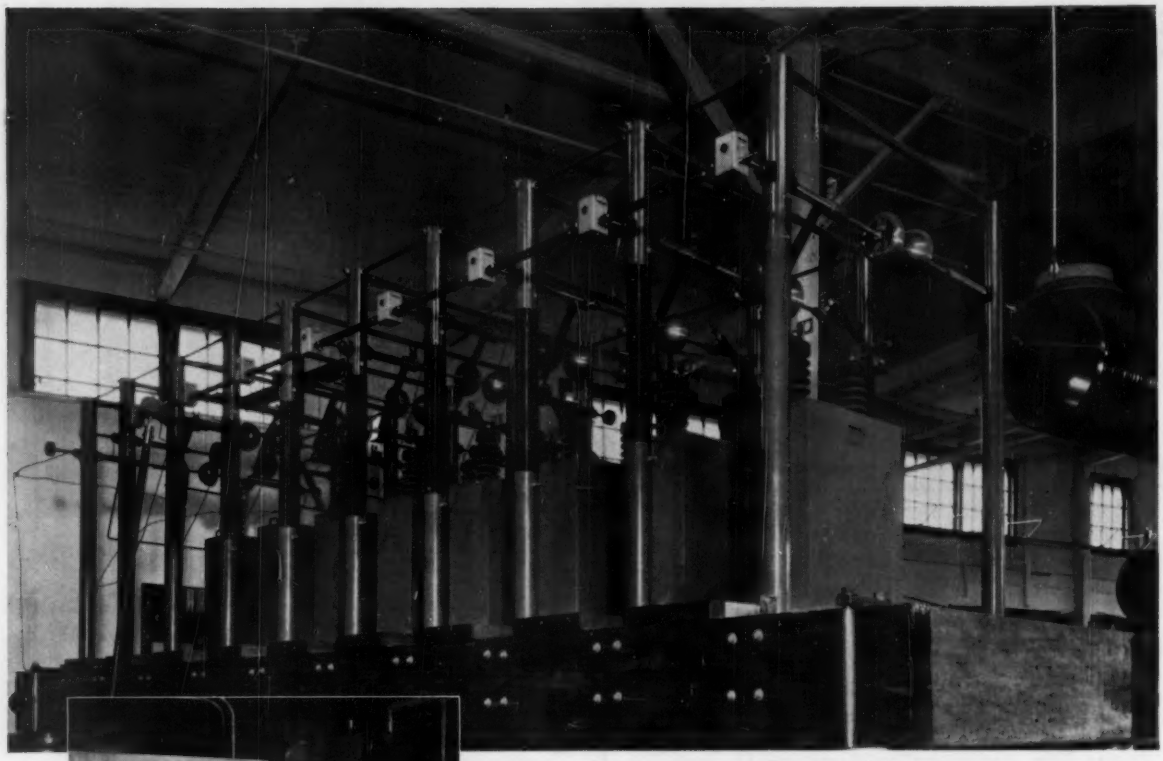
B U S I N E S S I N F O R M A T I O N



The technician at the control panel of Victor's impulse generator shown above, is photographing steep front wave forms for detailed laboratory study.

Steep Front Wave Tests at *VICTOR* Help Make Better Insulators

By David E. Alexander, Chief Engineer
Victor Insulators Division, I-T-E Circuit Breaker Co.

"The high voltage impulse generator in the Victor electrical laboratory enables us to simulate the most severe conditions of service an insulator will ever experience in use. By photographing the various wave forms caused by high voltage discharges, we are able to study in detail and at length, their many characteristics and their effects on insulator design and construction.

For some time now, we have been delving into the little known realm of steep front wave forms. This research has already resulted in better, stronger high voltage insulators . . . points the way to even better insulators as our studies continue."

This is but one phase of Victor's broad continuous program of research in electricity, ceramics and manufacturing methods . . . a program that bolsters our contention that "you can't buy better insulators at any price!"

I-T-E CIRCUIT BREAKER COMPANY
VICTOR INSULATORS DIVISION
Victor, New York

The Management Newsletter

Report on
Electrical Business Outlook

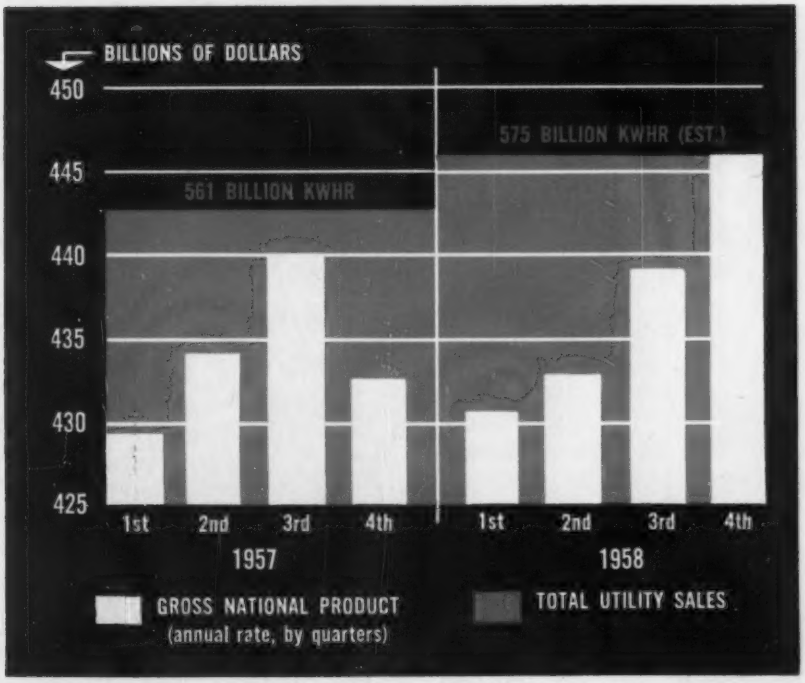
I. A Rebound in Business?

Except for utilities, most industries feel pretty glum about 1958 prospects. The big worry seems to be this: Are we heading into a major recession—more serious than 1954, more serious than 1949? In short, are we getting into the first real depression since World War II? . . . The answer is still NO. We aren't in for that kind of trouble.

You can see the "makings" of at least a moderate recovery in the second half of 1958 in the following factors:

• **Personal income shows more than enough strength to support a rebound.** Despite the sharp cutbacks in production, incomes have dipped only 1% so far (thanks largely to unemployment compensation). There are sure to be wage increases this spring, if only because 4 million workers will get automatic wage boosts under long-term agreements. And workers bargaining for new contracts should do at least as well, even if it means taking a slice from corporate profits. All in all, a moderately rising income curve seems like a good bet for 1958—particularly if unemployment stabilizes by mid-year.

• **Business should get some lift from defense and a turn in inventories.** Right now business is trimming excess stocks with a vigor seldom matched. More than 75% of the $7.4 billion drop in 4th quarter GNP (see chart below) came from a run-off in inventories, and liquidation has been just as heavy in the last two months. Meanwhile the demand for consumer goods has not slumped appreciably, and requirements for defense goods are about to rise. New orders for military hard goods will just about double in the first half of 1958, after



bumping along at a low level during the last six months of '57 when the Dept of Defense was struggling to stay within its budget.

• **Easier credit conditions should help to speed the recovery.** Housing should be pushing ahead strongly throughout 1958 now that its tight money headaches have lessened. Starts got off on the right foot in January as they moved up to an annual rate of 1,030,000—the best month for quite a spell. State and local construction (particularly highways) will also be picking up some of the slack in industrial building during the year.

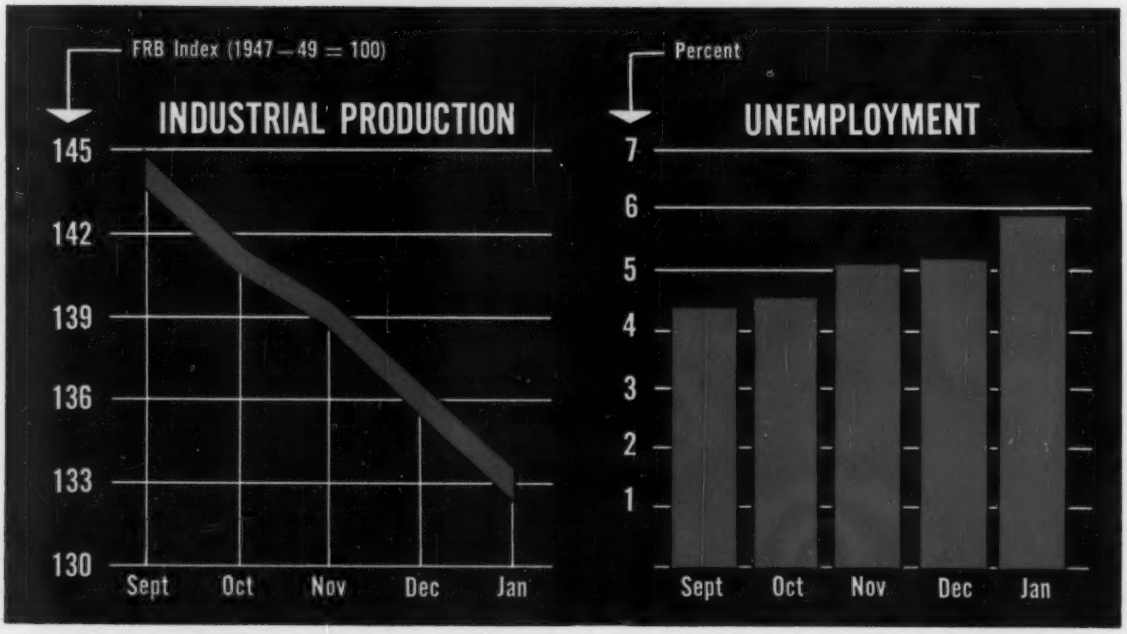
II. How Much of a Recession?

Industrial production is now running almost 10% below last year's peak. The FRB index may be off another point or so in March—and conceivably a serious strike could pull it down even lower in a later month. But it's still a good guess (based mainly on the spurt in defense hard goods) that the index will level out around 130, after its sickening drop from 145 last August. That means an average of about 136 for 1958, which brings down EW's industrial load forecast a shade. But most of the drop in output is behind us, or as one economist put it: "Business seems to be getting retroactively worse."

The '58 downturn still qualifies as an extremely mild recession. Statistically at least, the business slump is following the approximate dimensions of the 1954 and 1949 adjustments which—by contrast to the real depression of the 1930's—were of very modest proportions. To tick off the figures: From peak to low point, industrial output was also off 10% in the two previous postwar recessions. Personal income is down only 1% this time, compared to a 5% drop in '49 and 1.4% in '54 (thanks to a tax cut). Unemployment is now 5.8%, compared to 7% in late '49 and a high of 6% in the '54 downturn.

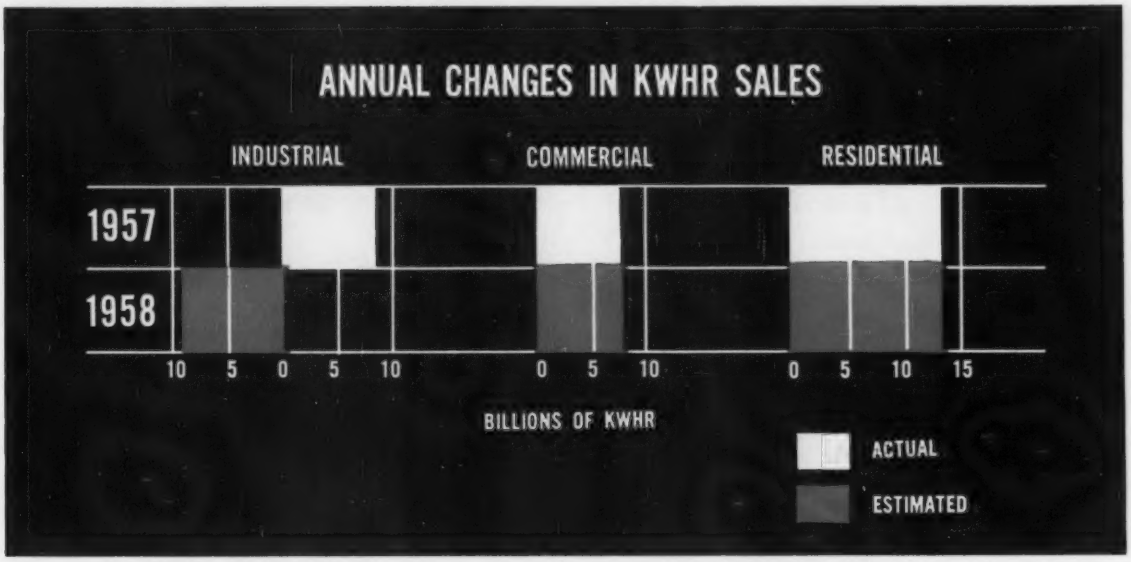
III. How Big a Rebound?

Just how much of an upturn is coming depends largely on Washington—and whether Congress cuts taxes or votes a bigger budget in attempt to speed the



recovery. There's still some feeling in Washington that a somewhat larger military program alone can bring the economy back to full employment. But sentiment for a tax cut is growing—particularly with 4.5 million unemployed in an election year.

Meanwhile—with or without a tax cut—the outlook is still for better business by the end of 1958. Of course, we won't have anything that approaches a real boom until capital expenditures start moving up again. (We'll know more about what's happening in this key sector of the economy with the McGraw-Hill survey in April.) The current feeling of "too much capacity, too little profit" may have caused some more cuts in investment, but the situation is still not as bleak as some of the more gloomy pessimists try to paint it.



IV. What About Electric Utilities?

Utilities won't be badly burnt by the recession, but they'll be singed. Total kwhr sales should climb, but not at the rate of the last few years. Assuming no tax cut to stimulate industrial production, EW expects total '58 sales to reach about 575 billion kwhr—for a 2½% gain over 1957.

Industrial sales are in for a drop. Falling industrial production has already left some marks on the '58 picture that a second-half upturn will not be able to erase completely. And AEC sales, cut in mid-'57, will be down after a full year of running at the reduced rate. However, industrial kwhr sales usually drop less than industrial production during a recession—more efficient plants consume much more power per unit of production, while plants not fully used automatically consume more power per unit due to fixed uses (lighting, etc.). For 1958 EW looks for a 3.2% drop in industrial sales.

Commercial sales should rise by about 8% to almost 103 billion kwhr. In this "year of the hard sell", expect an increase in display lighting and—more important to kwhr sales—expect stores to stay open longer.

Residential sales, helped by the housing pickup, should climb almost 9%. The total looks like 160 billion kwhr, which would beat '57 by 13 billion kwhr.

Facts and Figures

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Nov.	127.51	126.81	119.91	6.3
Peak—Class I Systems (million kw)	Dec.	107.1	.....	102.4	4.6
Estimated Dec. '58 Peak (million kw)	Nov.	122.6	122.6	123.0	−0.3
Production—billion kwhr	Nov.	51.79	53.16	50.65	2.3
Hydro		10.90	10.04	9.31	17.1
Fuel		40.89	43.12	41.34	−1.1
Sales—billion kwhr	Nov.	47.28	47.62	45.84	3.1
Residential		12.93	12.19	11.67	10.8
Commercial		7.64	7.86	7.20	6.1
Industrial		24.28	24.99	24.57	−1.2
Other		2.42	2.58	2.39	1.3
Fuel Consumption	Nov.				
Coal—million tons		13.62	13.82	14.04	−3.0
Oil—million barrels		6.68	6.42	7.14	−6.4
Gas—billion cu ft		93.11	111.80	88.46	5.3
Net Income Class A & B Co's—$ million	Nov.	113.84	101.87	103.39	10.1
Residential Customers—millions	12 mos.	46.77	46.69	45.62	2.5
Revenue per kwhr	ended	2.56¢	2.56¢	2.60¢	−1.5
Avg kwhr per customer	Nov. 30	3,156	3,135	2,956	6.8
Avg annual bill		$80.79	$80.26	$76.86	5.1
Moody's Averages					
Public Utility Bond Yields	Feb.				
Aaa		3.62	3.68	3.74	−3.2
Aa		3.68	3.73	3.81	−3.4
A		3.96	3.93	4.05	−2.2
Baa		4.23	4.60	4.26	−0.7
24 Utility Stocks					
Price	Feb.	$53.27	$53.04	$49.98	6.6
Earnings (latest qtr)	Dec. (est)	3.42	3.35	3.35	2.1
Dividends (annual rate)	Feb.	2.46	2.46	2.41	2.1
Yield (%)	Feb.	4.62	4.64	4.82	−4.2
Indexes: 1947–49 = 100					
FRB Industrial Production	Jan	132	133	145	−9.0
ENR Construction Cost	Feb.	155.9	155.9	148.9	4.7
BLS Cost-of-living	Jan.	122.3	121.6	118.2	3.5
New Orders for Machinery (1950 = 100)	Dec.	128	119	138	−7.2
NEMA Sales					
Insulation materials	Dec.	112	123	139	−19.4
Electric appliances		66	74	84	−21.4
Wholesale prices					
Motors and generators	Dec.	143.3	143.0	140.6	1.9
Transformers and regulators		149.2	150.8	146.6	1.8
Switchgear and fuses		171.2	171.2	163.9	4.5
GNP—annual rate—$ billion	4th qtr.	432.6	440.0	426.0	1.5

SEE BELOW

SEE BELOW

Appliance sales continued to skid in December. The NEMA index (1947-49 = 100) dropped to 66—the lowest level since the index was revised in mid-1953. The previous low point had been reached in December '53, when it fell to 69. December is traditionally a poor month for appliances, however—more of the consumer's dollar goes for perfume and bicycles. January pickups are usual.

Utility bond yields bounced up late in February, after having dropped like a rock all during January. Moody's "A"'s wound up higher than the January average. Much of the "bounce" can be blamed on the sheer volume of offerings that hit the market in the final week of the month.

EDWARD C. DUFFY

HOWARD B. WAKEMAN

WILLIAM WELCH, JR

LILCO Officers Rise to New VP Positions

In recent top executive promotions, Long Island Lighting Co advanced Edward C. Duffy and Howard B. Wakeman to senior vice presidential posts and elected William Welch, Jr, as a vice president of the company.

Duffy, until his most recent promotion, had been operating vice president for five years. His responsibilities in this post included engineering, constructon, and electric and gas operations. During his 16 years' association with the utility, he has served in various positions of increasing responsibility in the engineering and power production fields. They include electric operating manager and assistant vice president of electric operations.

Wakeman comes to his new post after having served as vice president with responsibility for community relations and commercial affairs. During his 30 years with LILCO, he has devoted his time to various phases of commercial work. He had previously been customer relations manager and assistant vice president of customer relations.

Welch, whose new position places him in charge of engineering, has been with LILCO for 16 years. During this time he has been steam power engineer, assistant mechanical engineer, assistant gas operating manager, assistant vice president, and engineering manager in charge of engineering and architectural work. He is a mechanical engineering graduate of Stevens Institute of Technology.

Also elected as vice presidents of the company were Charles Y. Osburn, who has been placed in charge of employee relations; and Samuel W. Horsfield, who is responsible for gas operations.

WWP Elevates Brunzell to Executive VP

GEORGE M. BRUNZELL

The new position of executive vice president of Washington Water Power Co has been assumed by George M. Brunzell, formerly a vice president of the utility.

As executive vice president, Brunzell will be responsible for the administration and coordination of all phases of Washington Water Power's operations.

Brunzell, a 22-year veteran with WWP, has been vice president since February, 1957. His experience with the company includes positions as division engineer for the Coeur d'Alene and Big Bend divisions, assistant plant superintendent and plant superintendent at Spokane. In recent years he has also served as manager of the Spokane Division and as assistant to the president.

A graduate of the University of Idaho with a degree in electrical engineering, Brunzell was associated with Idaho Power Co before joining WWP in 1936.

Crowdes and Murray Get Simplex Promotions

G. J. CROWDES

J. M. MURRAY

Simplex Wire & Cable Co has announced the recent appointments of G. J. Crowdes as director of engineering and John M. Murray as sales manager.

Crowdes has been chief engineer, engineering department, since 1950. Since joining Simplex in 1918, he has also been electrical tester, research engineer, assistant electrical engineer, and assistant chief electrical engineer. He is a Fellow and life member of American Institute of Electrical Engineers and has been active in the organization's Boston section.

Murray, a 30-year Simplex employee, had been assistant sales manager since 1952. Before joining the company's sales department in 1935, he had held posts in its electrical research lab and engineering department.

Gerlach Heads Penn-Union Electric

Clinton G. Gerlach was recently elected as president and director of Penn-Union Electric Corp by the company's board of directors.

Gerlach previously served as vice president of the Erie, Pa., firm. A certified public accountant, he joined Penn-Union in 1952 and has since served as controller and treasurer as well.

Before his affiliation with Penn-Union, he was with Arthur Anderson & Co, public accounting firm.

CLINTON G. GERLACH

PERSONAL BRIEFS

New Orleans Public Service Co, Inc, has named **Charles J. Sinnott** as general sales manager to succeed **E. N. Avegno,** now executive assistant.

A. M. Ashlock is new chief system operator at Public Service Co of Colorado. **Roy W. Goddard** was made assistant chief system operator.

New England Electric System has elected **R. Leigh FitzGerald** secretary and **Albert E. Westwood** assistant treasurer . . . **Edward A. Britts** succeeds retiring **Arthur S. Dempsie** as Clatsop district manager for Pacific Power & Light Co.

Roy M. Godwin, manager of the safety department of the Philadelphia Electric Co retired on March 1 . . . Pacific Power & Light Co has retired **Fred Eckel,** manager in Wapato, Wash. . . . **Randolph Halliday Nexsen,** chief of the power bureau of the New York Public Service Commission, retired on March 1.

H. N. Williams has advanced to system engineer for Kansas Power & Light Co's electric department . . . Concurrent with the expansion of its industrial power department, Duke Power Co has named **Creed F. Gilley, Jr,** as director of industrial development.

Bureau of Reclamation at Denver has named **Grant Bloodgood** as assistant commissioner and chief engineer and **E. G. Nielsen** as associate chief engineer.

Quebec Hydro-Electric Commission's Engineering Design Division recently appointed **Guy Monty** assistant transmission engineer; **Marcel Abran** construction engineer; and **Roland Bourgault** project engineer. In addition, **Andre Dufresne** was made director of auxiliary services and **Maurice A. Paradis** became superintending engineer of shops and transportation dept.

Harold A. Kertz has been named a member of the District of Columbia's Public Utilities Commission for the remainder of a term expiring June 30, 1959.

Tennessee Valley Authority recently named **Charles J. McCarthy** as TVA general counsel to succeed **Joseph C. Swidler,** who resigned last fall.

Harold M. Cantrell is new district manager of Bonneville Power Administration, with headquarters in Kalispell . . . **Leslie N. McClellan** retired on Feb. 28 as assistant commissioner and chief engineer of Bureau of Reclamation.

(*More briefs on page* 118)

The Meetings Calendar

MARCH

Interstate Power Club — Hotel Martinique, New York City, March 17.

American Council To Improve Our Neighborhoods—Building Industry Congress on Urban Renewal, co-sponsored by the National Housing Center, Washington, D. C., March 17-18.

• **Canadian Electrical Association**—Western Zone Meetings, Bessborough Hotel, Saskatoon, Que., March 17-19.

National Association of Corrosion Engineers—Annual Conference & Exhibition, Municipal Auditorium, San Francisco, Calif., March 17-21.

Electric Companies Public Information Program—Mid-Atlantic Regional Meeting, Baltimore, Md., March 19.

American Institute of Electrical Engineers and American Society of Mechanical Engineers—Joint Management Conference Committee, Hotel Somerset, Boston, Mass., March 19-20; Southwest District Meeting, Mayo Hotel, Tulsa, Okla., March 31-April 2.

Edison Electric Institute — Industrial Relations Committee, Headquarters, New York City, March 20; Annual Sales Conference, Edgewater Beach Hotel, Chicago, Illinois, March 24-27.

Institute of Radio Engineers—National Convention, Waldorf-Astoria Hotel and New York Coliseum, New York City, March 24-27.

Northwest Public Power Association—Engineering and Operations Section, Clark County PUD Electric Center, Vancouver, Wash., March 26-27.

American Power Conference—20th Anniversary Meeting, Sherman Hotel, Chicago, Ill., March 26-28.

Oklahoma Utilities Association — Annual Convention, Oklahoma Biltmore Hotel, Oklahoma City, Okla., March 27-28.

Pacific Coast Electrical Association—Engineering & Operation Section, Sheraton Palace, San Francisco, Calif., March 27-28.

Electrical Maintenance Engineers Association of Southern California—Industrial Electric Show and Conference, Shrine Convention Hall, Los Angeles, Calif., March 27-29.

Agricultural and Mechanical College of Texas—First Annual Texas Conference on the Utilization of Atomic Energy, College Station, Texas, March 31-April 2.

Southeastern Electric Exchange—Annual Meeting, Boca Raton Hotel and Club, Boca Raton, Fla., March 31-April 2.

APRIL

Rural Electrification Administration — 9th Annual Electric Generating Plant Operation and Maintenance Conference, Phoenix Hotel, Lexington, Ky., April 7-10.

Indiana Electric Association—Young Mens' Utility Conference, Evansville, Ind., April 8-9.

Microwave Research Institute — Symposium on Electronic Waveguides, held in cooperation with Institute of Radio Engineers, New York City, April 8-10.

Rocky Mountain Electric League—Spring Conference, Shirley-Savoy Hotel, Denver, Colo., April 13-15.

American Institute of Electrical Engineers—Rubber and Plastics Industries Subcommittee, Mayflower Hotel, Akron, Ohio, April 14-15; Middle Eastern District Meeting, Washington, D. C., April 28-30.

Agricultural and Mechanical College of Texas—11th Annual Conference for Protective Relay Engineers, College Station, Texas, April 14-16.

Edison Electric Institute—National Conference of Electric and Gas Utility Accountants, held jointly with AGA, Shamrock Hilton Hotel, Houston, Texas, April 14-16; Industrial Relations Committee, Headquarters, New York City, April 17; Accident Prevention Committee, Commodore Perry Hotel, Toledo, Ohio, April 27-30; Purchasing and Stores Committee Meeting, Hotel Nicollet, Minneapolis, Minn., April 28-30.

American Welding Society—Sixth Annual Welding Show, and Technical Meeting, Kiel Auditorium and Hotel Statler, St. Louis, Mo., April 14-18.

Missouri Valley Electric Association—Engineering Conference, President Hotel & Municipal Auditorium, Kansas City, Mo., April 16-18.

Northwest Public Power Association, Inc—Annual Membership Meeting, Ridpath Hotel, Spokane, Wash., April 16-18.

Southeastern Electric Exchange—Engineering and Operations Meeting, Buena Vista Hotel, Biloxi, Miss., April 21-23.

Northwest Electric Light & Power Association—Engineering & Operating Section, combined with Personnel & Safety Section and Purchasing Committee, Chinook Hotel, Yakima, Wash., April 23-25.

Pacific Coast Electrical Association — Administrative Services Section, Hotel Valley Ho, Scottsdale, Ariz., April 23-24.

Pennsylvania Electric Association—Meter Committee, Galen Hall Hotel, Wernersville, Pa., April 24-25.

• **American Power Dispatchers Association**—National Spring Meeting, Los Angeles, Calif., April 25-26.

MAY

American Society of Tool Engineers—26th Annual Meeting and Tool Show, Philadelphia Convention Center, Philadelphia, Pa., May 1-8.

Edison Electric Institute—Area Development Committee, New York City, May 1; Commercial Cooking Conference, Chicago, Ill., May 6.

Air Conditioning and Refrigeration Institute—Annual Meeting, The Homestead, Hot Springs, Va., May 4-7.

National Electrical Contractors Association — Districts Six, Eight, and Nine Annual Conference, Hotel Biltmore, Los Angeles, Calif., May 5-7.

• **American Public Power Association** — Annual Meeting, Roosevelt Hotel, New Orleans, La., May 6-8.

• **Illuminating Engineers Society** — Intermountain Regional Conference, Hotel Whitman, Pueblo, Colo., May 8-9.

• **Pennsylvania Electric Association**—Electric Equipment Committee, Skytop Lodge, Skytop, Pa., May 8-9; Relay Committee, Hotel Cleveland, Cleveland, Ohio, May 15-16.

• Additions this week.

MORE BIG DATES FOR '58

Edison Electric Institute—26th Annual Convention, Boston, June 9-12.

American Institute of Electrical Engineers — Summer General Meeting, Buffalo, June 22-27.

National Electrical Manufacturers Association—Annual Meeting, Atlantic City, Nov. 10-14.

National Association of Railroad and Utilities Commissioners — Annual Convention, Westward Ho Hotel, Phoenix, Ariz., Nov. 17-20.

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General Electric Co VP **William C. Wichman** has been named general manager of the GE Supply Co Division in Bridgeport . . . The semiconductor products dept, as part of a new management organization in the transistor manufacturing plant in Buffalo (N. Y.), has promoted **Triest J. Cappello** to manager of quality control; **Fred J. Feller** to manager of materials and inventory control; and **W. Jesse Harber, Jr,** to manager of manufacturing engineering.

Donald J. Tricebock, as new manager of Diamond Power Specialty Corp's Electronics Division, will have complete charge of engineering, manufacturing, sales, and service for the Utiliscope and UtiliVue systems of industrial television.

Concurrent with the sale of controlling interest in Four Wheel Drive Auto Co to Paradynamics, Inc, **George E. Mallinckrodt** was elected chairman of FWD's board to replace **Franklin Lyons,** who resigned. Mallinckrodt is also president of Paradynamics.

F. A. Ritchings is new assistant consulting mechanical engineer and **E. C. Yaw** new chief mechanical design engineer for Ebasco Services, Inc.

L. William Kates has risen to director of engineering at Sylvania-Corning Nuclear Corp . . . Gould-National Batteries, Inc, has named **John R. Scholl** as chief engineer of its Nicad Div.

W. E. Lawton is new northwest power manager for Aluminum Co of America at Vancouver, Wash. He succeeds **Waldo Porter,** now production assistant on power matters at the Smelting Div, Pittsburgh . . . **Mead Warren, Jr,** has succeeded retired **J. Elmer Housley** as district power manager of Alcoa's Tennessee operations . . . **E. D. Mairs** and **Hugh J. Morrison** are assistant general managers for Alcoa's Fabricating Div.

Edgar J. Garbarini is Bechtel Corp's new resident vice president for Power & Industrial Div in Southern California. In addition to his present duties managing and coordinating power and industrial projects in the area, he will also be responsible for managing major design and construction of Southern California Edison Co's power projects undertaken by Bechtel.

Carter L. Burgess has been elected president of American Machine & Foundry Co . . . H. K. Porter Co, Inc, has advanced **Fred W. Elliott** to vice president. . . . New general sales manager for Lenkurt Electric Co is **Weston C. Fisher.**

Federal Pacific Electric Co has named **Frank S. Nelson** manager of its Scranton plant and **Bernard G. Tremblay** assistant plant manager at Newark, N. J. . . . Smithcraft Lighting has named **George T. Wood** manager of lighting sales.

John L. Marsh is new marketing specialist in the power utility field for Ansonia Wire & Cable Co.

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OBITUARY

Russell C. Bennett, 69, retired vice president of Sangamo Electric Co, died recently in Springfield, Ill.

SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co recently advanced Paul S. Castner to manager of sales, Pittsburgh Works . . . Frank M. Nolan is new manager of sales for A-C's switchgear department . . . At the Norwood (Ohio) Works, William H. Davis rose to manager of product sales, electrical department . . . John M. Gasque has been named application engineer in the general apparatus sales section of the electrical application dept, West Allis Works.

Brown Boveri Corp has appointed Allen C. Conger as Northwest regional manager in charge of the firm's new Portland, Ore., office. He will direct engineering and sales of Brown Boveri's power generating distribution, transmission, and industrial equipment in Oregon, Washington, Montana, Idaho, and Alaska.

Chase Brass & Copper Co, concurrent with its reorganization of the Forgings Division, has transferred E. Rowland Chase to the mill and warehouse sales division. He'll be responsible for promotion and sale of forgings in brass, aluminum, titanium, and other metals. Thomas J. Marshall will assist him.

Federal Pacific Electric Co's Middle Atlantic region has made the following appointments: C. G. Landeck was made distributor products sales manager for the region; George A. Bury, product manager for switch and fusible equipment; and F. C. Karlson, Baltimore district manager. In addition, Arthur Wolfe was named field representative in the Harrisburg (Pa.) area and Richard Oxley became field representative in Scranton.

General Electric Co's Apparatus Sales Division recently appointed M. Randall Marston, Jr, as manager of the user industries sales department for the San Diego territory. Arthur Rowe is new district sales representative for the division in Los Angeles. His former post of manager-indoor sales for the ballast department has been assumed by Eugene C. Pauly . . . In the insulator department, Louis M. Brock has been named district manager at Kansas City. Territory includes Iowa, Kansas, Minnesota, North Dakota, western Missouri, eastern and middle sections of Nebraska and South Dakota, and northwestern Wisconsin . . . The metallurgical products department has appointed Harry Jason manager of the new Southern district; John J. Galvin manager of the Midwestern district; and Robert Rennie sales representative of the Atlantic district.

Graybar Electric Co, Inc, has appointed W. K. Collum as manager at Roanoke, Va.; A. C. Larson as manager at Springfield, Ill.; H. Bryson as manager at Indianapolis; E. W. Windahl as assistant district manager at Minneapolis; and E. J. Hussey as manager of the Garden City (N. Y.) office and warehouse . . . At New York City General Department headquarters, B. F. Benning was advanced to manager of lighting sales, and W. D. Skorburg to assistant manager of inside construction sales. Both appointments become effective April 1.

H. M. Harper Co's newly named central district sales manager is John Mengel.

Iowa Malleable Iron Co has announced the appointment of Robert K. Eaton to the sales staff of Iowa Malleable and its subsidiary, Everstick Anchor Co.

Lima Electric Motor Co, Inc, has designated Jack B. Hicks as district manager in charge of the recently opened New York district sales office in New York City.

Olin Mathieson Chemical Corp recently named Edward B. Reynolds as New York regional sales manager of Olin Aluminum. From headquarters in New York City, he will have responsibility for New York, New Jersey, and New England.

Westinghouse Electric Corp's Sturtevant Division has named as its new regional manager for the Midwestern region George Steiner. He will supervise and direct field sales activity in Illinois, Indiana, Wisconsin, Minnesota, Iowa, Nebraska, South Dakota, and North Dakota.

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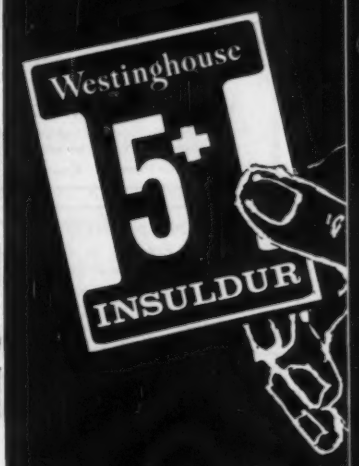

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Readers Forum

Reply to Merriken

To the Editor:

The Readers Forum page of the February 17th issue of the Electrical World prints a letter from one Wilbert L. Merriken, attorney-at-law, in criticism of a statement concerning the availability of adequate electric service to farms by a man of the industry, Mr. C. H. Whitmore.

Your correspondent, with the usual technique of some law practioners to make their own interpretation of the words of others, refers to a portion of Mr. Whitmore's article as, "the understatement of the year". Let me reply to this letter with the query, "Was you there, Wilbert?", and, herein, perhaps enlighten him on the subject of rural electrification.

They Wouldn't Buy

I can remember the many long days with the innumerable evening meetings in Iowa, five years prior to the early 1930's, our rural electric salesmen and myself spent out among the farmers along the routes of prospective rural electric lines, trying to sell them and even high-pressure them if you please, to sign an application for rural electric service. We normally succeeded in getting about half the prospective customers signed up—then the real job began. We, and their friends and neighbors, pleaded with them to help us get a sufficient number of applications signed to make the rural line extension possible, and economically feasible at the low minimum monthly charge of $4.50. I can still remember the sarcastic remarks I heard on the high cost of electricity compared to their own light plant on which maintenance and repairs alone often exceeded the monthly minimum charge of $4.50. I can still hear them tell us about "being independent" with their own plant and that they went to bed with the chickens and couldn't possibly use that much electricity. "The use of power on the farm—ridiculous." "I've got my tractor with a power take-off and I've got plenty of corn cobs for the kitchen stove, and Mary keeps our food in a nice cool cellar."

When I think of those days out along the proposed rural electric lines, and the nights spent at some rural school at a meeting for the benefit of those prosperous farmers, I wish Wilbert and Clyde Ellis could have been there to use their prolific vocabularies to persuade them to Live Better Electrically. I do know that they would have a different viewpoint on the real reason electricity on the farm was delayed until the big give away of the New Deal days came along; when even the R.E.A. had some difficulty getting the $5.00 membership application signed. Yet, I can recall a story of the farmer who came to a small town bank in Iowa to pay off the mortgage. His wife, Mary accompanied him. Farmer Jones lifted up the milk pail and shoved it through the cashier's window. The banker counted it out and remarked, "There's $15,000 here and your mortgage is only $10,000." To which the farmer's wife, Mary, exclaimed, "John, you brought the wrong pail."

Farmers At Fault?

Couldn't it be possible that the farmers themselves were at fault for the delay in getting electric service? They wouldn't take it until the politicians got worried about their votes and fixed it so that Uncle came through and gave it to them for nothing.

How's that for the true story of how the farmer got adequate electric service? If you don't believe it, look at the tax deductions on any pay check. People like Wilbert should speak from experience before they make noises about the self-supporting tax-paying electric companies which without subsidies, have done their part in bringing better living to more people under our American system of free enterprise. Let Wilbert show us an attorney-at-law, or a politician or even an opportunist who, living off the rural electric cooperatives, has done as much, if he can.

E. A. Nickelsen, E. E.

1666 17th Ave.
San Francisco, Calif.

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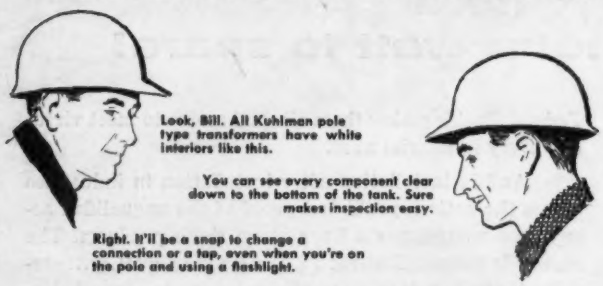
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